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EXPORT NUMBER

BUYERS' DIRECTORY—PAGE 157
ADVERTISING INDEX—PAGE 180

CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper covering in a practical manner the mechanical power, foundry and allied fields.
Published by the MacLean Publishing Company, Limited, Toronto, Canada.

Vol. XXI. No. 18. Publication Office: Toronto, May 1, 1919 Subscription Price $3.00 per Year

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WW

Where the Best in Service Meets the Best in Machinery

OUR ELABORATE NEW BUILDING 84 INSPECTOR STREET

Our 28 years of extensive experience—our knowledge of varied requirements—our facilities to make special analyses, and our almost unlimited sources of supply enable us to assume full responsibility for results and to serve you with dispatch.

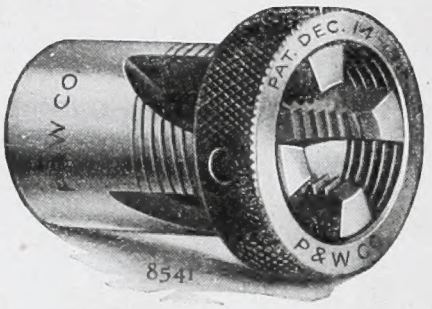
Williams & Wilson, Limited
MONTREAL, P.Q.



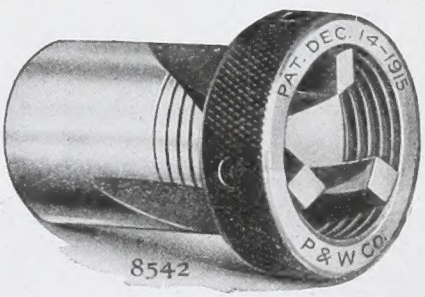
SMALL TOOLS

Taper Thread Adjusting Collar

Insures Uniform Concentric Adjustment



Spring Screw Die



Hollow Mill

P. & W. Spring Screw Dies and Hollow Mills

Advantages of the Taper Thread Adjusting Collar

Ease and delicacy of adjustment to FINE LIMITS are secured without trouble and loss of time.

All lands or prongs of the die or hollow mill are adjusted in or out exactly the same amount by merely turning the collar, thus giving rise to the term CONCENTRIC ADJUSTMENT.

This concentric adjustment results in each land or cutting edge doing its proper share of work, and as a perfect circle is always maintained, accurate results are assured.

By having the bearings always on the point, there is no tearing while backing off, and the correct amount of clearance is obtained.

Write for 4-page descriptive Circular giving size and dimensions.

Precision Machine Tools, Standards & Gauges

PRATT & WHITNEY CO.

OF CANADA, LIMITED

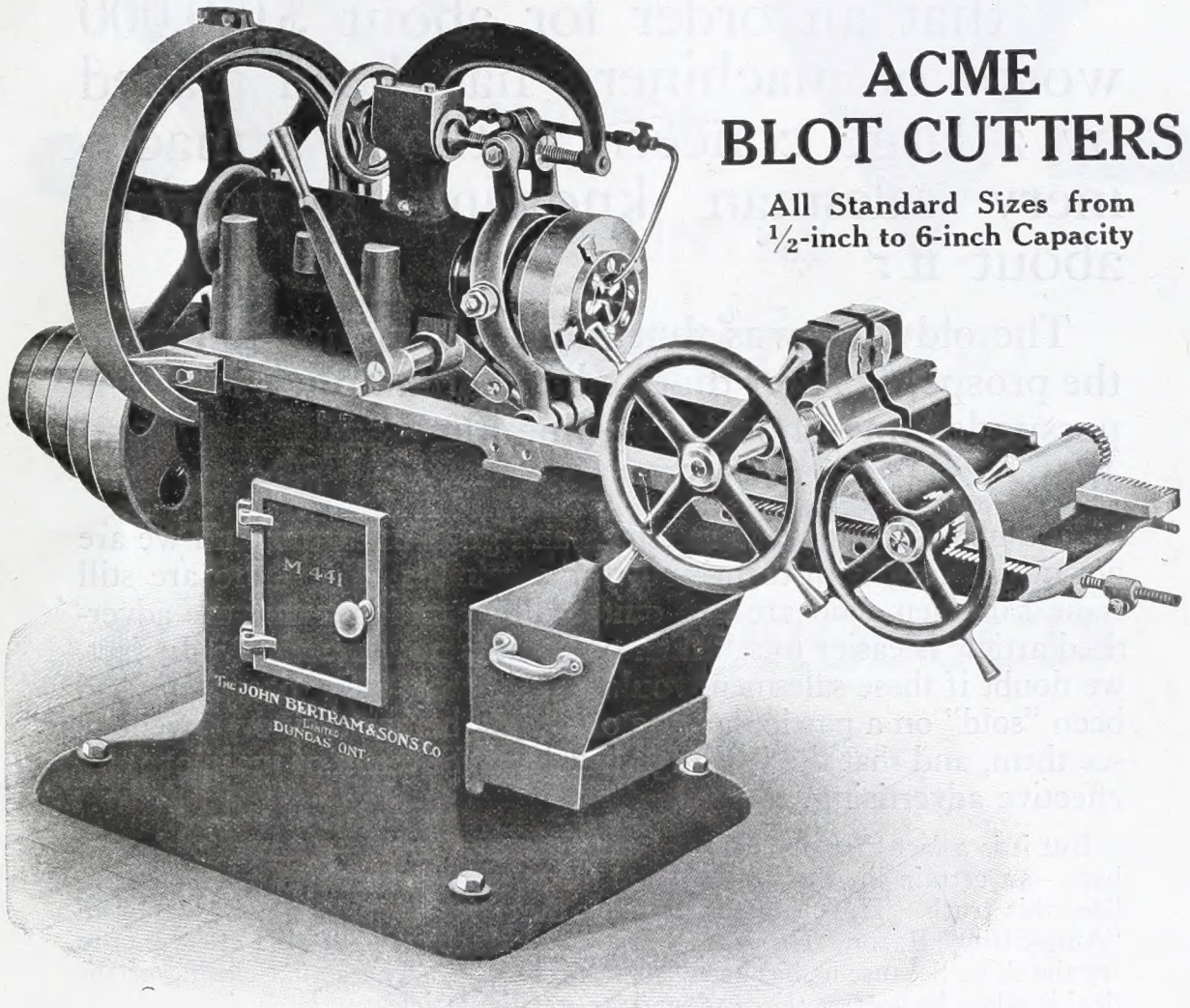
Works: DUNDAS, ONTARIO

MONTREAL	TORONTO	WINNIPEG	VANCOUVER
723 Drummond Bldg.	1002 C.P.R. Bldg.	1205 McArthur Bldg.	B.C. Equipment Co.

BERTRAM MACHINE TOOLS

ACME BLOT CUTTERS

All Standard Sizes from ½-inch to 6-inch Capacity



Supplied with Leadscrew Attachment for Stay Bolts or other work requiring special Accuracy of Pitch.

WRITE US FOR FULL DETAILS ON ANY MACHINE OR MACHINES IN WHICH YOU ARE INTERESTED

The John Bertram & Sons Company Limited

DUNDAS, ONTARIO, CANADA

MONTREAL	TORONTO	VANCOUVER	WINNIPEG
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The Publisher's Page

TORONTO MAY 1, 1919

WOULD you be surprised to know that an order for about $150,000 worth of machinery has been placed by a large concern without a machinery salesman knowing anything about it?

The old idea was that the salesman had to dig up the prospect. After that he had to camp with him—persuade him—show him—dine him—and finally land him.

It is necessary to have salesmen and good ones, too, and we are not quarrelling with them—not for a minute. But there are still some salesmen who are not quite willing to admit that the advertised article is easier to sell than one that is not advertised. In fact, we doubt if these salesmen would admit that their prospects had been "sold" on a particular line or article before they ever went to see them, and that the "selling" had been the result of judicious and effective advertising.

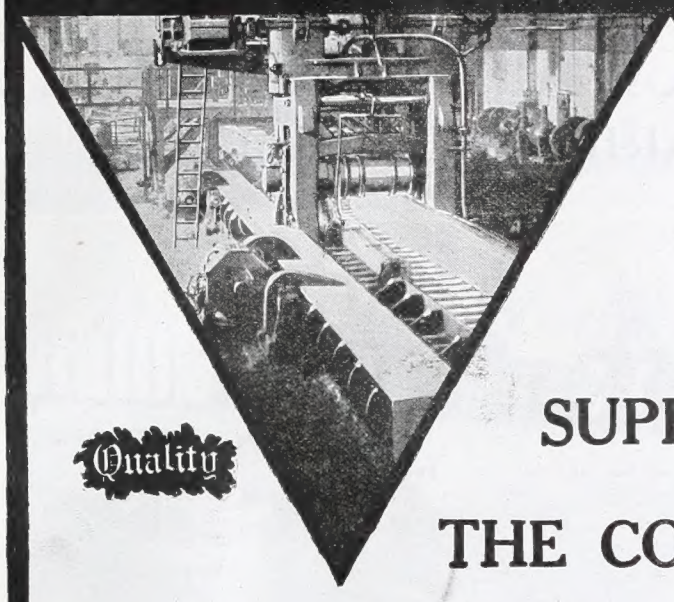
But it is a fact that thousands of customers are "sold" — unconsciously perhaps—on certain lines of goods. And the wise and successful salesman realizes this truth. The customer goes into the store. He buys a "Gillette" or an "Auto-Strop" Razor. He doesn't ask the clerk about it at all. He wants to try the thing because he has been "sold" previously. The actual closing of the deal is when he goes to the store and secures the article.

But to get back to this $150,000 order of machinery. The purchasing agent was sitting in his office when I met him. He had his plans and specifications. He knew how many drills, presses, cutters, etc., he wanted. He knew also just what make and kind he required for the work, and he simply sat down and made out the list.

At his elbow were a number of catalogues, with the corners of pages turned in, and beside him was also a copy of this very paper you are reading—CANADIAN MACHINERY.

Was your message in that issue or in previous issues? Big plans, where hundreds of thousands are involved, are being worked out and planned out right now in the period between war work and peace time trade. Sales are really being made when manufacturers in some cases are slack. Once they have everything framed up, once they know what they want and where they can get it, it's too late then to rush in with your sales story. The advertiser who has been persistent and consistent in driving home his story during the apparently slack season has been keeping his message right there when it will do more good than after everything starts to hum.

Canadian Machinery and Manufacturing News, May 1st, 1919. Vol. 21, No. 18. Published weekly at 143-153 University Ave., Toronto, Canada. Subscription price in Canada, $3.00; in United States, $3.50. Entered as second-class matter at the Post Office Department, Ottawa, Canada. Entered as second-class matter July 1, 1912, at the Post Office at Buffalo, under the Act of March 3rd, 1879.





SUPPORT

THE COUNTRY

THAT SUPPORTS YOU

If you consider your personal interests—the interests of your family and the community in which you live, you will

PURCHASE THE PRODUCTS

OF

CANADIAN MILLS

A Canadian Dollar
is Worth One Hundred Cents
in Canada

THE

STEEL COMPANY

OF

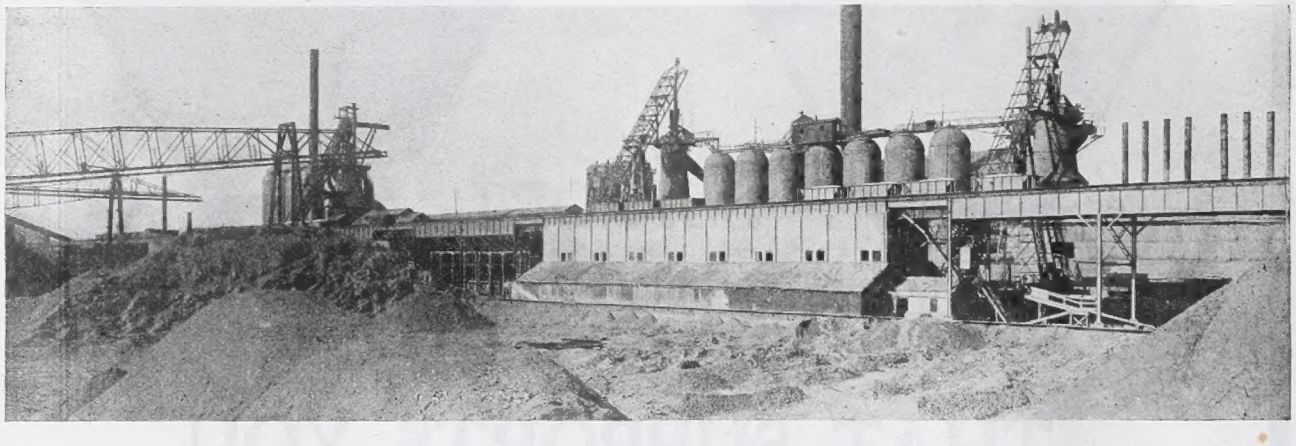
CANADA

LIMITED

HAMILTON - - MONTREAL

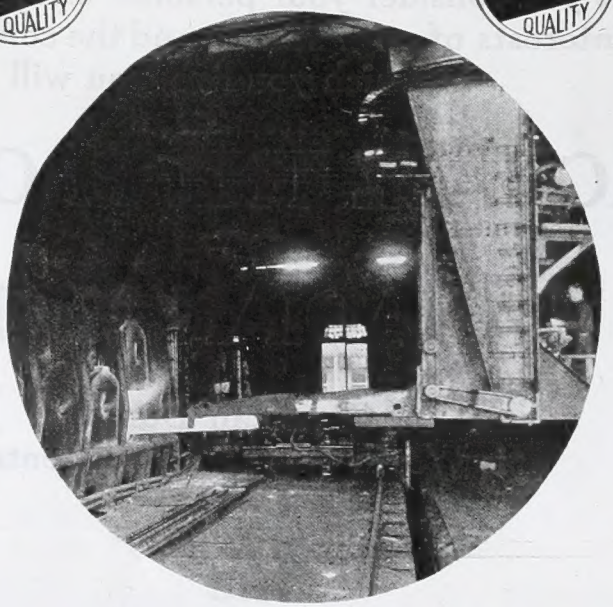
ALGOMA STEEL CORPORATION, LTD.

SAULT STE. MARIE, ONTARIO



BLOOMS,
BILLETS,
SLABS,
STRUCTURAL STEEL
MERCHANT BARS
CONCRETE REINFORCING BARS
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MARK OF ALGOMA O.H. QUALITY

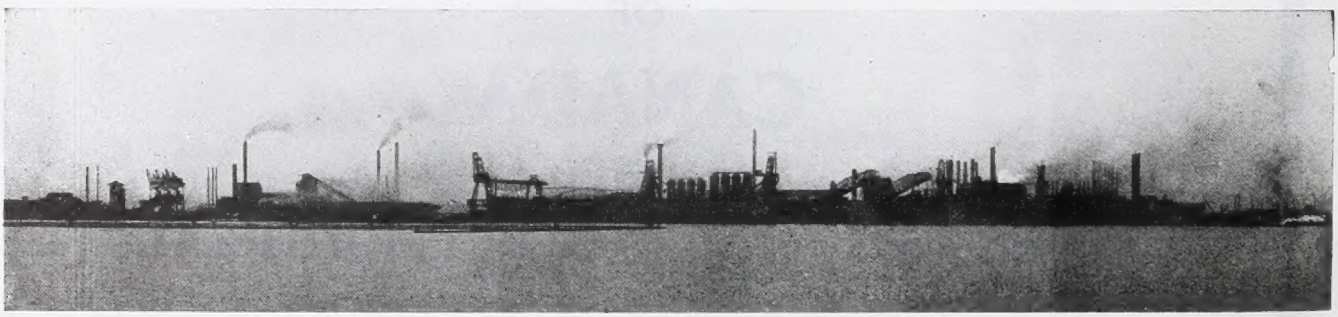


Charging and Withdrawing Crane

Sulphuric Acid. *Nitre Cake*

MARK OF ALGOMA O.H. QUALITY

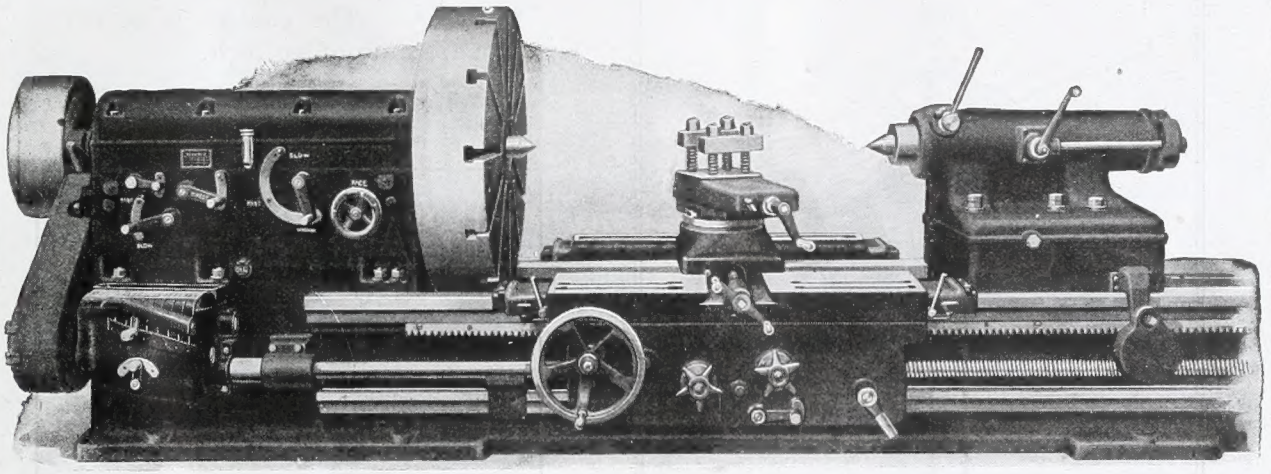
STEEL RAILS
Open Hearth Quality
(All Sections from 12 lbs to 100 lbs per yard)
SPLICE BARS
STEEL TIE PLATES
PIG IRON
BASIC, FOUNDRY-BESSEMER
SULPHATE OF AMMONIA



GENERAL VIEW OF THE PLANT OF THE ALGOMA STEEL CORPORATION FROM THE WATERFRONT

BRIDGEFORD

Many of the World's Largest Industrial Plants are Bridgeford Equipped



A Few Bridgeford Equipped Plants

Bethlehem Steel Co.
Carnegie Steel Co.
Midvale Steel Co.
Pennsylvania Steel Co.
Cambrai Steel Co.
American Car & Foundry Co.
New York Central R.R.
General Electric Co.
Pennsylvania R.R.
Westinghouse Electric & Manufacturing Co.
Baldwin Locomotive Works
American Locomotive Co.
Erie Forge Co.
International Harvester Co.
Timken Detroit Axle Co.
American Bridge Co.
Packard Motor Car Co.
Pierce Arrow Motor Car Co.
Union Tool Co.
Standard Oil Co.

What better endorsement of quality and reliability could be obtained than the fact that many of the world's largest industrial plants are Bridgeford equipped?

Let the judgment of "big business builders" guide you in the selection of lathes.

Listed at the side are a number of representative plants using Bridgeford equipment—convincing evidence of the popularity and reliability of Bridgeford Heavy Duty Lathes.

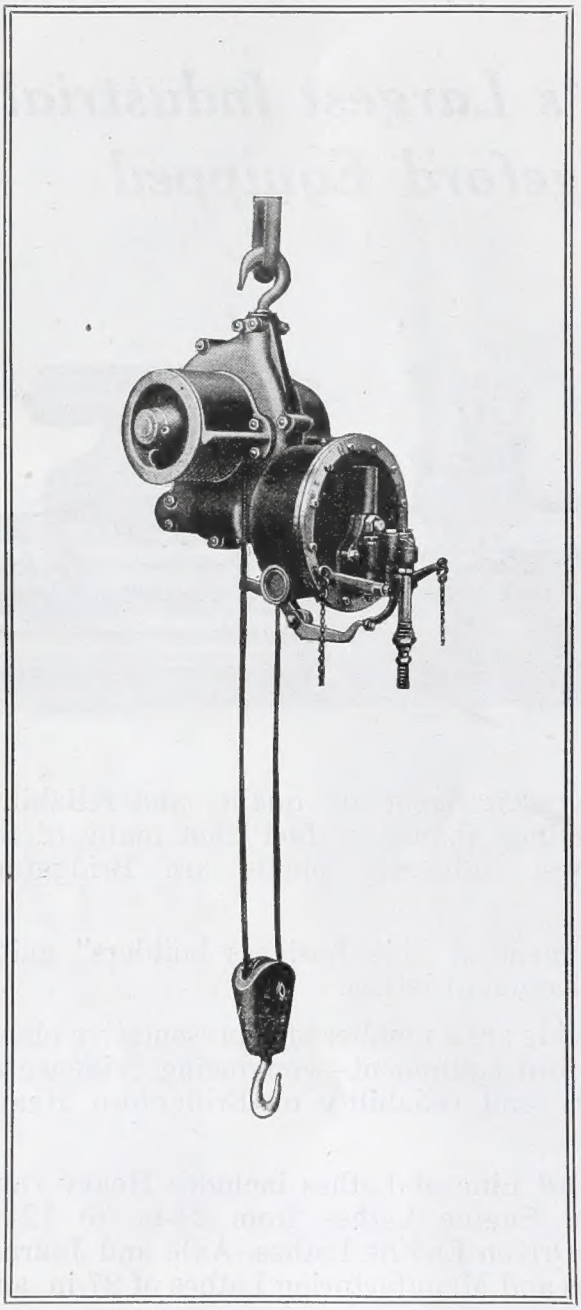
The Bridgeford Line of Lathes includes Heavy Duty Geared Head Engine Lathes from 24-in. to 72-in. swing, Cone Driven Engine Lathes, Axle and Journal Truing Lathes and Manufacturing Lathes of 27-in. and 30-in. swing.

There's a Bridgeford for every heavy duty lathe requirement. Write or wire for details showing how Bridgeford Lathes increase production and cut costs. We are in a position to make prompt deliveries.

Bridgeford Machine Tool Works 151 Winton Road, Rochester, N.Y., U.S.A

Manufacturers of Heavy Duty Lathes for more than 20 years

The "IMPERIAL" Hoist Saves Time



An "Imperial" hoist on jib crane or monorail will cut handling times in half for your large machine tools, and pay for itself in a few weeks. The construction of the motor is of the simplest type; fewer parts and stronger. The control is accurate to a fraction of an inch.

The Automatic Stop Insures Safety First

For 100 ten-foot lifts per day, the power cost of the 4,000-lb. "Imperial" hoist is 30 cents per day. Sizes from 1 ton capacity to 5 tons, and the "Imperial" hoist will always take its full rated load.

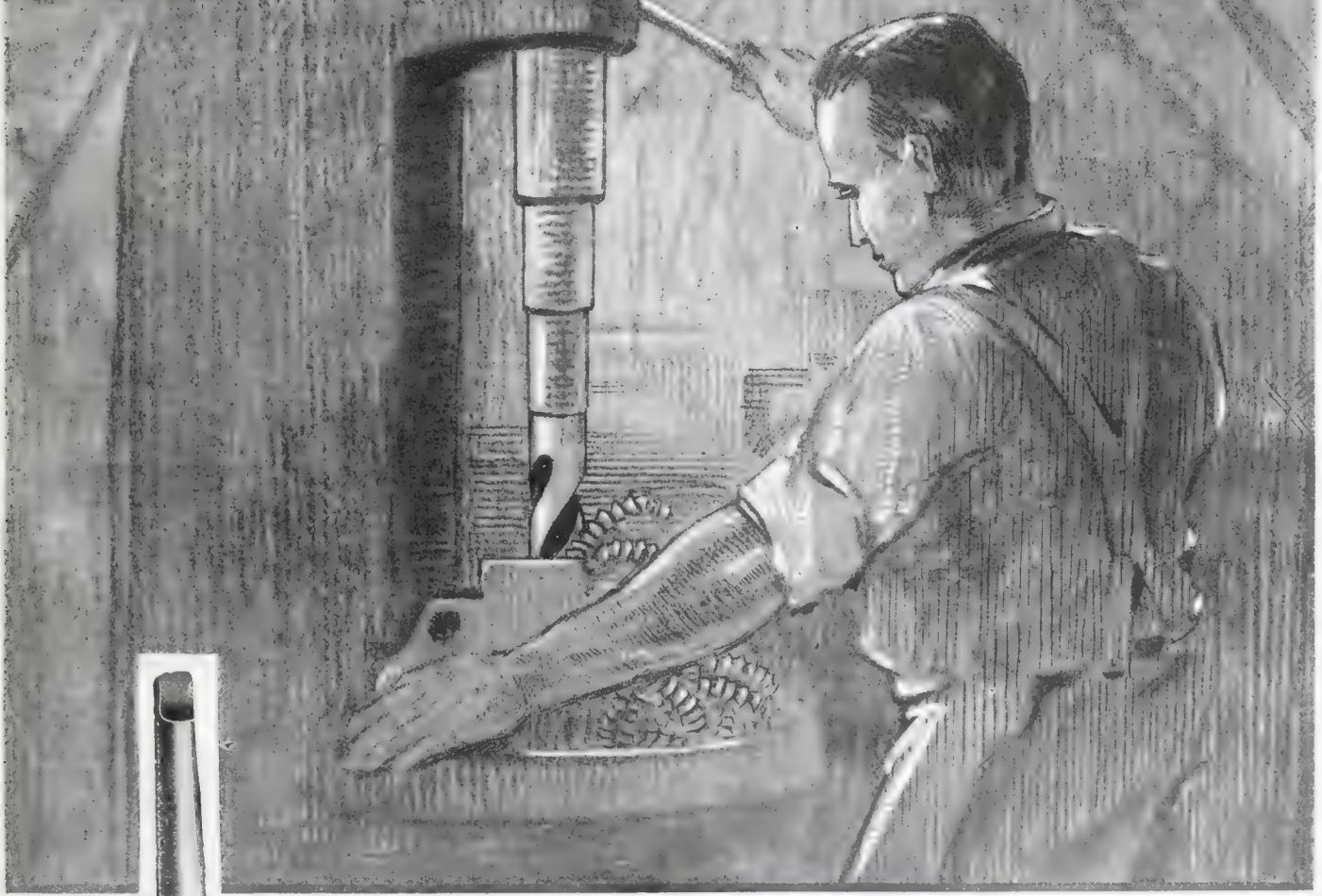
We have the size for your particular need

Canadian Ingersoll-Rand Company Limited

Sydney Sherbrooke Montreal Toronto Cobalt
Winnipeg Nelson Vancouver

WILT

HIGH SPEED AND CARBON TWIST DRILLS, REAMERS AND MILLING CUTTERS





Quality Tools a Vital Necessity

Where there's a WILT--There's the Way.

Equip your plant with modern tools of the best quality. It is the vital necessity of the day to manufacturers. Competition of the present and in the future demands it.

For your drilling, reaming and milling cutter operations, choose *WILT High Speed and Carbon Drills, Reamers and Milling Cutters.* As compared with any ordinary tool they cut faster, more accurately, require less power, require less re-grinding and give longer service—and they cost no more than ordinary tools.

Put them to the test--you'll find them best.

Wilt Twist Drill Company

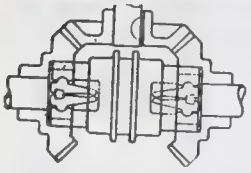
OF CANADA, LIMITED

Walkerville ∴ **Ontario**

London Office: Wilt Twist Drill Agency, Moorgate Hall, Finsbury Pavement, London, E.C. 2, England.

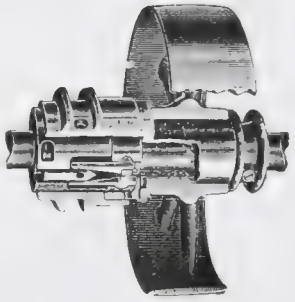
THE JOHNSON FRICTION CLUTCH

FOR SERVICE



DOUBLE CLUTCH
IN NEST OF GEARING

Note the Parts of This Clutch



STANDARD CLUTCH with Pulley Clutch Engaged



The leading engineers are specifying *Johnson Friction Clutches.* Our years of experience in manufacturing friction clutches place us in an excellent position to take care of your requirements. The *Johnson Friction Clutch* has but few parts and is easily modified to meet any conditions. Have *you* noticed the concerns who are using *Johnson Friction Clutches?* There's a reason. Service is in back of it all. What are your requirements?

You Should Have Our Yellow Data Sheets and Booklet "Clutches As Applied in Machine Building"

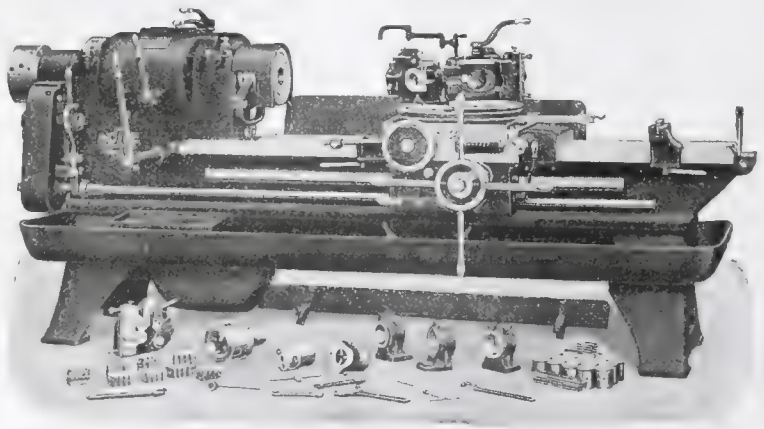
AGENTS: CANADA Williams & Wilson, 320 St. James St., Montreal. The Canadian Fairbanks-Morse Co., Ltd., Montreal and Branches. ENGLAND—The Efandem Co., Ltd., 22 Newman St., Oxford St., London, W. 1, Sole Agents for British Isles. AUSTRALIA—Edwin Wood Pty., Hdwe. Chambers, 231 Elizabeth Street, Melbourne, Victoria.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

Doubly Efficient—Does Both Bar and Chuck Work

This Cincinnati Acme Flat Turret Lathe is a double-production, geared head machine of the sliding gear type. It operates on minimum power because the only gears running are those doing the actual work.

This machine saves remarkable time and labor machining either bar work or chuck work up to 16 in. diameter.



3¼ in. x 36 in. Flat Turret Lathe Equipped for Bar Work.

Head is cast solid with the bed. You know what that means: accuracy, rigidity, constant and perfect alignment of spindle with vees, upon which the turret carriage travels.

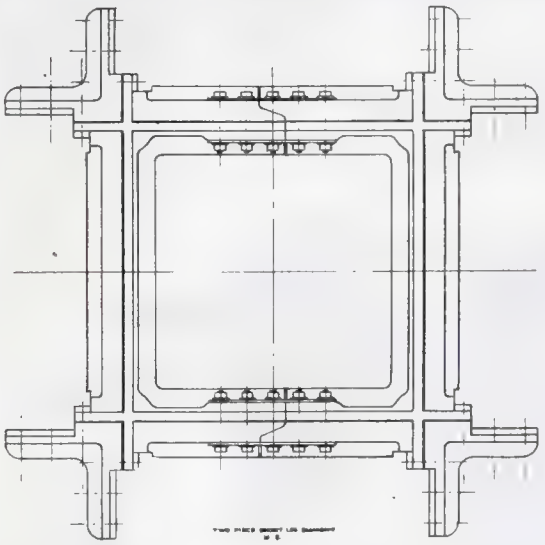
We also make a full line of Screw Machines and Turret Lathes.

Write for Valuable Bulletin

The Acme MachineTool Co.

Cincinnati, Ohio

Canadian Agents: Rudel-Belnap Machinery Co., of Montreal and Toronto



TRACK WORK

for Steam & Electric Railways

SWITCHES · MATES · FROGS
CROSSES · DIAMONDS · ETC.
COMPLETE INTERSECTIONS

Built-up, Hard-Centre or Solid Manganese-Steel Construction

Manufacturers of Balkwill Articulated Cast Manganese Crossings.

CANADIAN STEEL FOUNDRIES, LIMITED

Transportation Building, Montreal

Coal
Coke
Iron Ore



Pig Iron

Victoria FOUNDRY & MALLEABLE

Made by The Canadian Furnace Co.
Port Colborne, Ontario, Canada

M.A. HANNA & CO.

Sales Agents, CLEVELAND

Canadian Office:
1004 C.P.R. Bldg., Toronto

FIRTH'S Speedicut HIGH SPEED Steel

Insures Maximum Production

FIRTH'S CARBON TOOL STEELS
Standard Brands Highest Quality

THOS. FIRTH & SONS, Limited, Sheffield, England

CANADIAN WAREHOUSES: 449 St. Paul St. West, MONTREAL; 79 West Adelaide St., TORONTO

J. A. SHERWOOD
Canadian Manager

The Ford-Smith Machine Company

FORD-SMITH

Milling Machines

Swing Grinders



Water Tool Grinder

Disc Grinders

Special Machinery

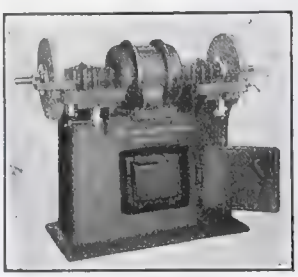
Polishers

Write for our latest

Catalogues and Price List



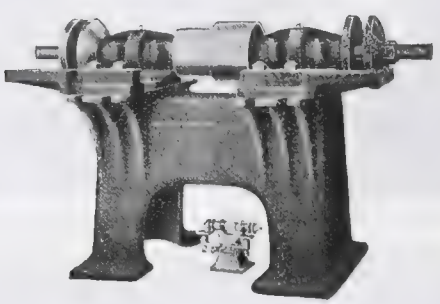
General Purpose Grinder



Motor Driven Floor Grinder

We solicit the privilege of quoting on your

Special Machinery



Heavy Type Floor Grinder

Manufactured by

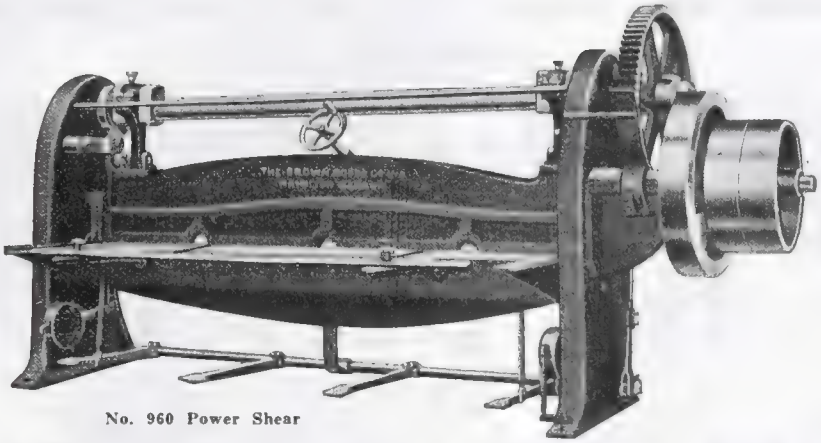
The Ford-Smith Machine Co., Ltd.

Hamilton, Ontario, Canada

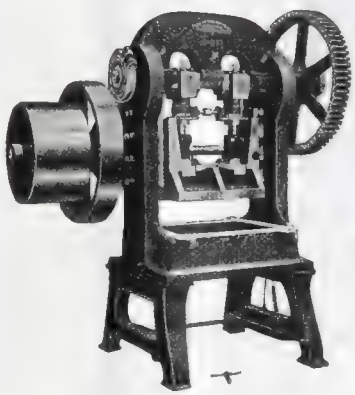
Foreign Agents:

W. E. Storey, 3 Arundel Street, London, Eng. Alf. Herbert, Ltd., 54 Dey Street, New York

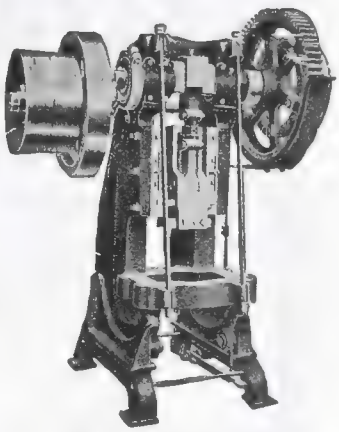
Stood The Test



No. 960 Power Shear



No. 20½ Power Press



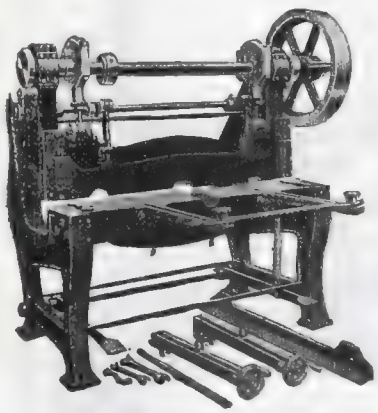
No. 215 Power Press

"B.B." Tools during the last four years have proven their superiority under the most trying conditions.

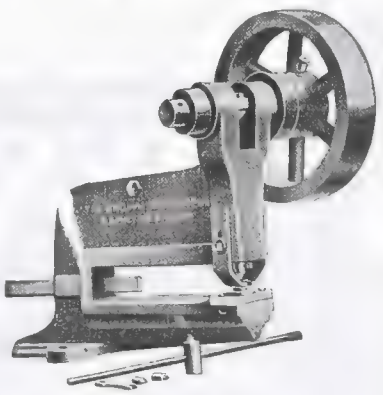
Inexperienced help and 24 hours' daily service will test the best machines.

Quality that is *"built in"* on a machine is bound to assert itself under such circumstances.

Our line comprises shears of all kinds, power presses for punching, forming, embossing, blanking, etc. Tinsmith's tools and sheet metal working machines of every description, also canners' and evaporators' machinery.



No. 404 Shear



No. 100 Power Punch

The Brown-Boggs Co., Limited

Hamilton, Canada

BRITAIN'S BEST

KE

BRANDS OF ALLOY & TOOL STEELS

In Billets, Bars, Sheets, Hot and
Cold Rolled Strips, Cold Drawn
Cast Steel, Wire and Drill Rods
HIGH GRADE STEEL FOR ALL PURPOSES

KE KELOCK

Principal Trade Marks

KAYSER ELLISON & Co LTD

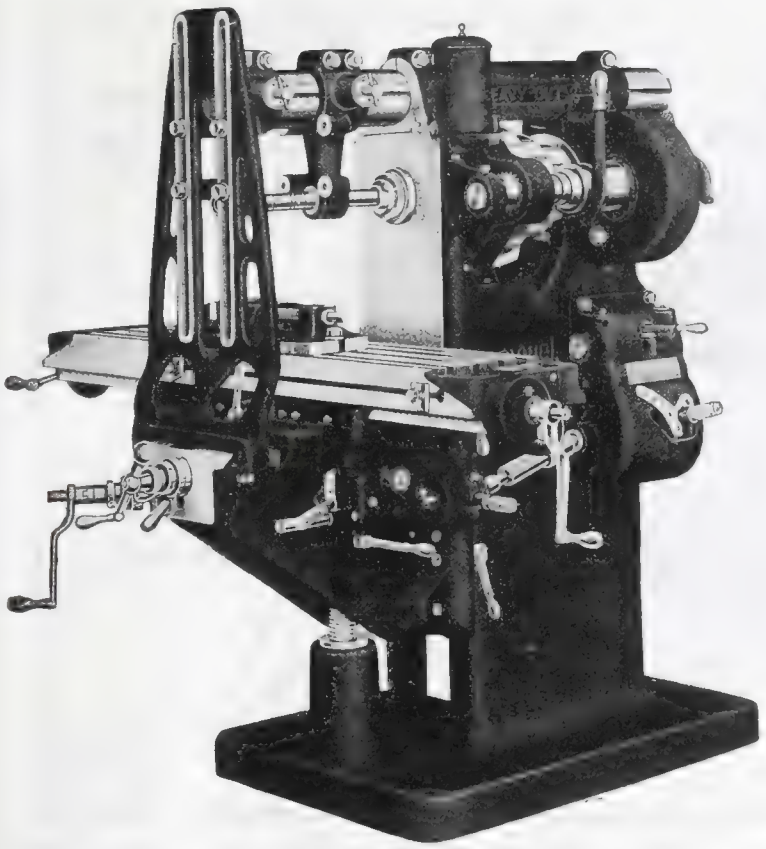
ESTABLISHED 1825 SHEFFIELD, ENG.

Complete Stock - Montreal Warehouse

RALPH B. NORTON

Agent

126 Craig St. West Montreal, Que.



LeBLOND

Heavy Duty Milling Machines

Plain or Universal Types—Cone or Gear Drive. All commercial sizes No. 0 to No. 5.

Adapted for the Heaviest Manufacturing or the most exacting tool room service. A suitable Range and Capacity for every class of milling.

Patent Self-Aligning Arbor Supports—

Hardened Steel Spindle Bearings—

Double-Friction Back Gears—and the simplest type of right-hand control, contribute to an increased production and longer life as a precision machine.

The R. K. LeBlond Machine Tool Company

CINCINNATI, OHIO, U.S.A.

Canadian Agents:

THE A. R. WILLIAMS MACHINERY CO., LIMITED
St. John, N.B. Montreal, P.Q. Toronto, Ont.
Winnipeg, Man. Vancouver, B.C.

E&M

ELECTRIC

Steel Castings

High Grade STEEL Castings
Of Every Description

Prompt Deliveries

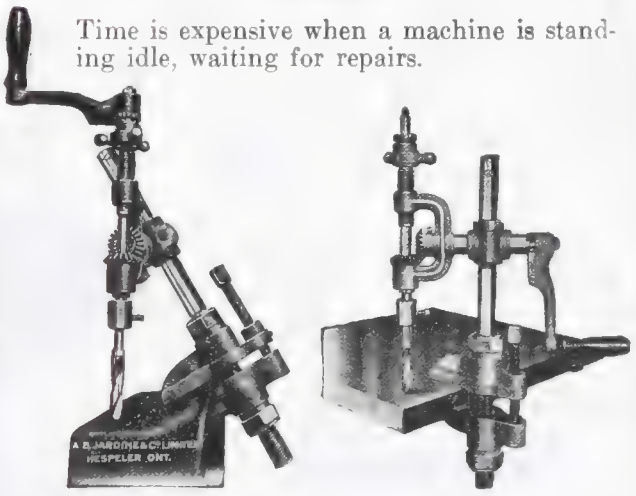
Send us your drawings for estimates.

THE ELECTRIC STEEL AND METALS COMPANY, LIMITED

WELLAND ONTARIO

Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



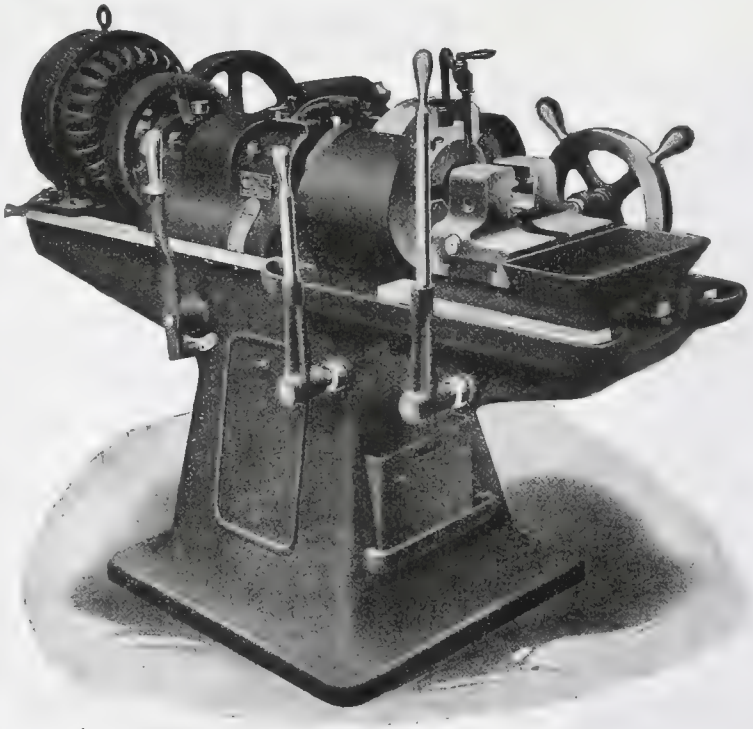
On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net

Sold by all Machinery and Supply Houses

A. B. JARDINE & CO., Limited

HESPELER, ONTARIO



FRONT VIEW
2-I ngle Head Nipple Machine—Motor Drive

Our New 2" Single Head Rapid Nipple and Pipe Threading Machine—Motor Drive

Constant Speed Motor
All Gear Drive - Change Lever
6 Changes of Speed
Large Reservoir
Special Oil Trough
Cutting Box
Many Other Features

JOHN H. HALL & SONS, Limited

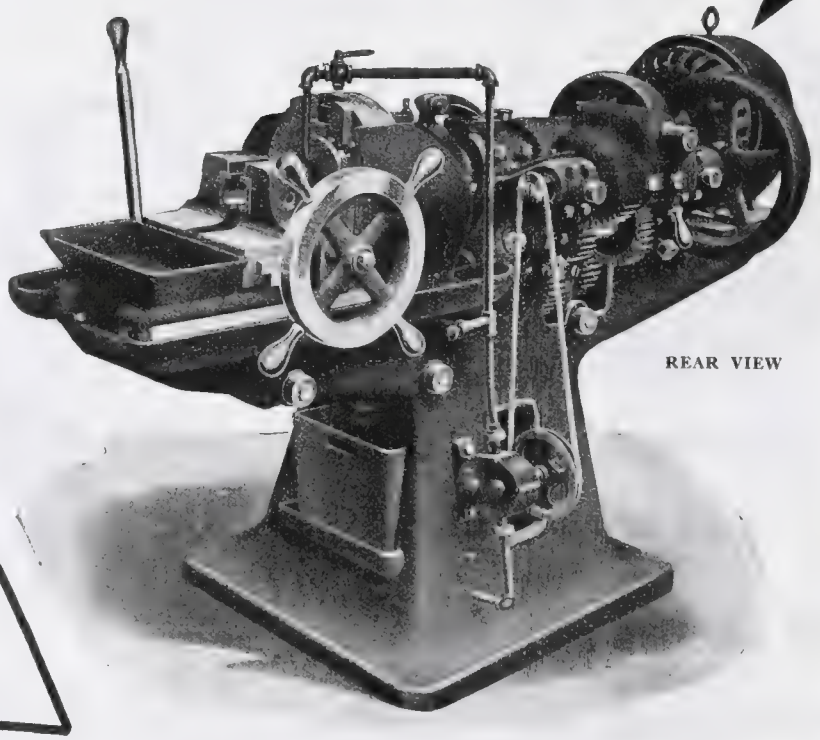
Manufacturers of

Pipe Threading Machinery

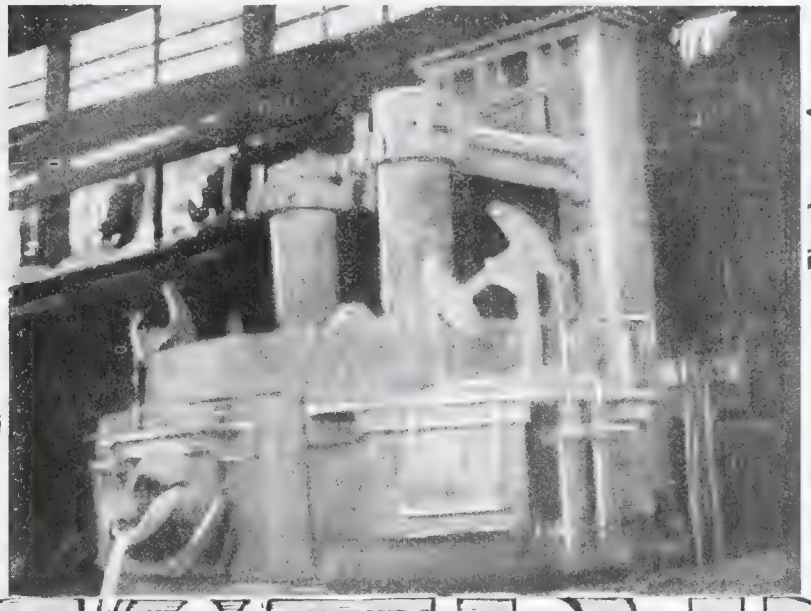
We Manufacture All Sizes

Roller Cutters
Pipe Machines
Nipple Machines
Special Machinery

WRITE FOR NEW DESCRIPTIVE BULLETINS JUST ISSUED



REAR VIEW



ELECTRITE

High Speed Steel

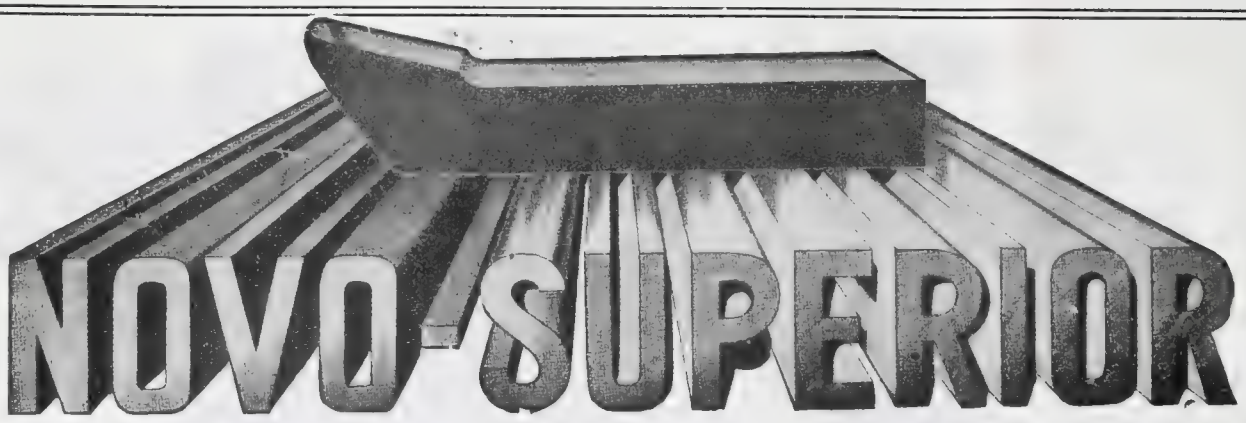
SEVERAL factors combine to make this high-speed steel a triumph of the steel-maker's art; Electric Furnaces—entirely infallible, automatically regulated, delivering the same result time after time.

Uranium—This rare element, cousin to Radium, effects a profound change in the texture and quality of the steel.

Added to these, the constant care and skill of years of steel-making experience make the result of each melt a foregone conclusion.

Latrobe Electric Steel Co.
LATROBE, PENN

URANIUM



HIGH SPEED STEEL

INTRA STEEL *GIBRALTAR STEEL*

Tool Steel for Every Purpose

Twist Drills, Taps, Hack Saw Blades, Milling Cutters, Files, Etc.,
Music Wire for Springs, Steel Balls.
Cold Rolled Mild Steel for Shafting, Etc.

We call to your particular attention that we make a specialty of and solicit your inquiries for

Circular Saws—for wood and for hot or cold metal cutting
Machine Knives—for cutting wood, paper, tobacco, agricultural.

H. BOKER & CO., INC., 332 St. James St., Montreal, P.Q.

Swedish Steel & Importing Co., Limited

Montreal
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Direct representatives of foremost Swedish mills; makers of

Tool Steels

ALLOY STEELS, BILLETS, BARS, DISCS, SHEETS, HIGH SPEED STEELS, DRILL RODS, DRAWN BARS, SEAMLESS TUBING, COLD ROLLED STRIP STEEL, WELDING WIRE, WROUGHT AND ROLLED IRON, PIG IRON, STEEL AND IRON ENDS, HOLLOW AND SOLID MINING DRILL STEEL.

TRADE MARK
SS
DOUBLE ESS

PROMPT SHIPMENTS from large stock

Forging Billets and Bars

Electric Furnace, Alloy Steels

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Annealed—Heat Treated

Piston Rods

Rough Turned—Annealed—Heat Treated

High Speed Steel

General Steel Company

Milwaukee, Wisconsin

DETROIT—823 Dime Bank Building

CANADA
FOUNDRIES & FORGINGS
LIMITED

A SOLEMN WARNING

A flood of business will overwhelm this country inside of two months. Problems of supply must be met and faced squarely. Those firms who have courage are getting their supplies now. Those who are hesitating are going to receive an awful jolt when they finally decide to proceed with business, because it will be impossible to get service. They will then blame everybody but themselves. Our solemn warning is, "Don't blame us because you didn't see this vision."

Canada Foundries & Forgings, Limited
WELLAND, ONT.

HAMMOND DIE BLOCKS

The STANDARD FOR QUALITY

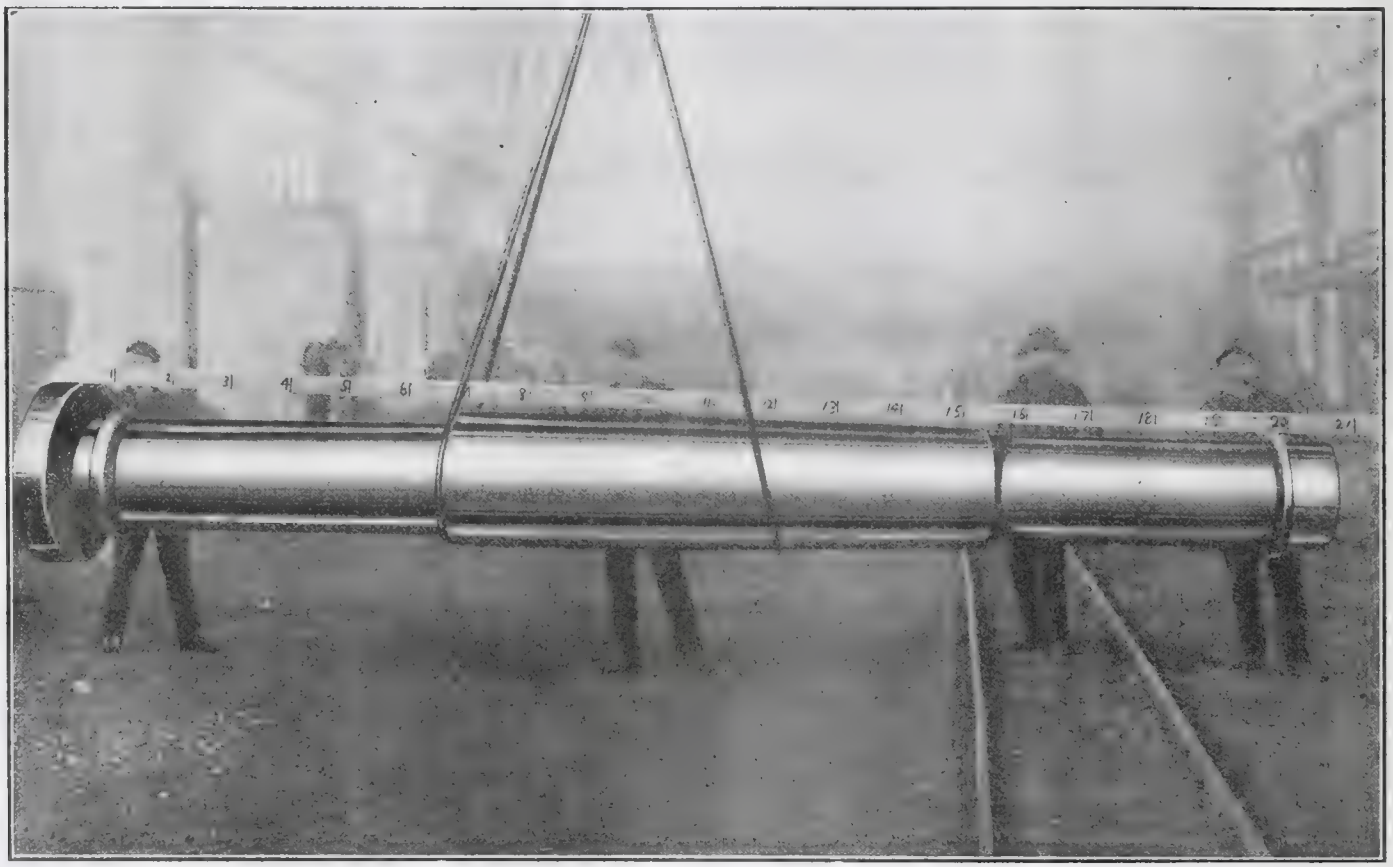
ALL SIZES FOR IMMEDIATE DELIVERY

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Detroit Office:---1257 DAVID WHITNEY BLDG.
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Nova Scotia Steel & Coal Company
Limited

New Glasgow, Nova Scotia, Canada



FINISHED COUPLING SHAFT, 18 IN. DIAMETER BY 21 FT. LONG

Heavy Marine Engine Forgings in the Rough or Finish Machined

Our Steel Plant at Sydney Mines, N.S., together with our Steam Hydraulic Forge Shop and modernly equipped Machine Shop at New Glasgow, N.S., place us in position to supply promptly Marine Engine Crank and Propeller Shafting, Piston and Connecting Rods; also Marine and Stationary Steam Turbine Shafting of all diameters and lengths, either as forgings or complete ready for installation, and equal to the best on the American Continent.



SaBeN ExTrA HIGH SPEED STEEL

The Highest Achievement of British Tool Steel Metallurgy.

SABEN

H. A. DRURY COMPANY LIMITED

MONTREAL TORONTO NEW YORK

2

IMPERIAL GENUINE BABBITT METAL

The High Grade Manufactured



Made specially for all HIGH SPEED, HEAVY ENGINES and EXTRAORDINARY HARD WORK

Manufactured and guaranteed to give excellent service by

THE CANADA METAL COMPANY, Limited, FRASER AVENUE TORONTO, Hamilton, Montreal Winnipeg, Vancouver

HOYT METALS

"Frost King"
"Trojan"
"Nickle Genuine"
BABBITTS

Hoyt Metals have been used with great success for many years.

Put them to the test and you'll soon see a difference in your babbitt cost.

All elements entering into our mixtures are carefully refined and put together in such proportions and in such relation to each other that the best possible alloy is secured for the work for which it is designed.

Annual sales over $5,000,000.



Hoyt Metal Co., Toronto

New York, N.Y. London, Eng. St. Louis, Mo.

WOLFRAM
HIGH SPEED STEEL

VULCAN
TOOL STEELS
for Every Purpose

Vulcan Special Vanadium—For Punches and Dies. Has wonderful wearing qualities.

Vulcan Non-Shrinkable—For Intricate Dies. Does not warp. Does not shrink.

Vulcan Regal No. 2—For Fine Finishing Tools. The highest grade tungsten finishing steel.

Vulcan Hecla—For work requiring great strength. The first high grade Chrome Vanadium steel produced in America.

WRITE FOR CATALOGUE

Vulcan Crucible Steel Co.
ALIQUIPPA *Established 1900* **PA., U. S. A.**
Makers of Wolfram High Speed Steel

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ANNOUNCEMENT

We will exhibit our line of **Bolt and Pipe Threading Machines** at the M.M. and M.C.B. Convention which will be held at Atlantic City, June 18th to 25th inclusive.

Daily demonstrations will be given with a 2″ Double Head Bolt Threading Machine and a 4″ Landis Pipe Threading and Cutting Machine. We will also show our Stationary Pipe Die Heads, Chaser Grinder, and **new Automatic Die Head.**

You are cordially invited to visit our booth, Spaces 131 and 133, Young's Million Dollar Pier. We believe it will pay you.



LANDIS MACHINE CO.

WAYNESBORO, PA.

Crucible

AND

Open Hearth Steel

Tool Steel

"ARGO" BRAND *HIGH-SPEED* STEEL

The John Illingworth Steel Co.

1856

Frankford, Phila.
New York Office 217 Broadway

RALPH B. NORTON, AGENT
Montreal, Canada

MacKINNON STEEL CO., LTD.

Engineers, Manufacturers and Erectors of Steel Structures

Industrial Bridges, Buildings, Towers, Smoke Flues and Stacks, Chutes, Coal Bins, Ore Bins, Tanks, Cranes, Engine Houses, Grain Elevators, Derricks.

Structural Steel and Steel Plate Work, and a combination of the two lines.

Prompt Deliveries Assured.

MacKINNON STEEL CO., LIMITED
Sherbrooke, Quebec
Montreal Office: 404 New Birks Building

The Human Element



That power in man that makes of him a man
Unfolds not only in himself, for if we scan
The product of his hands we find therein
There shines the reflex of his traits that win;
So, if the actual man himself is sought,
Look not on him, but see what he has wrought.

It is the intelligent interest and co-operative spirit combined with the skilful hands of our manufacturing force which give that undisputed excellence to

"Red Cut Superior"

THE NATIONALLY KNOWN—FIRST QUALITY

HIGH SPEED STEEL

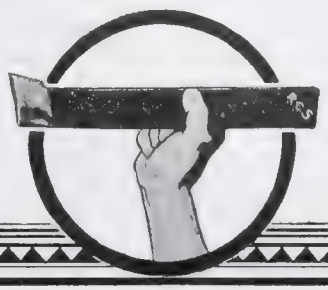
THE BEST FOR ALL MACHINE WORK

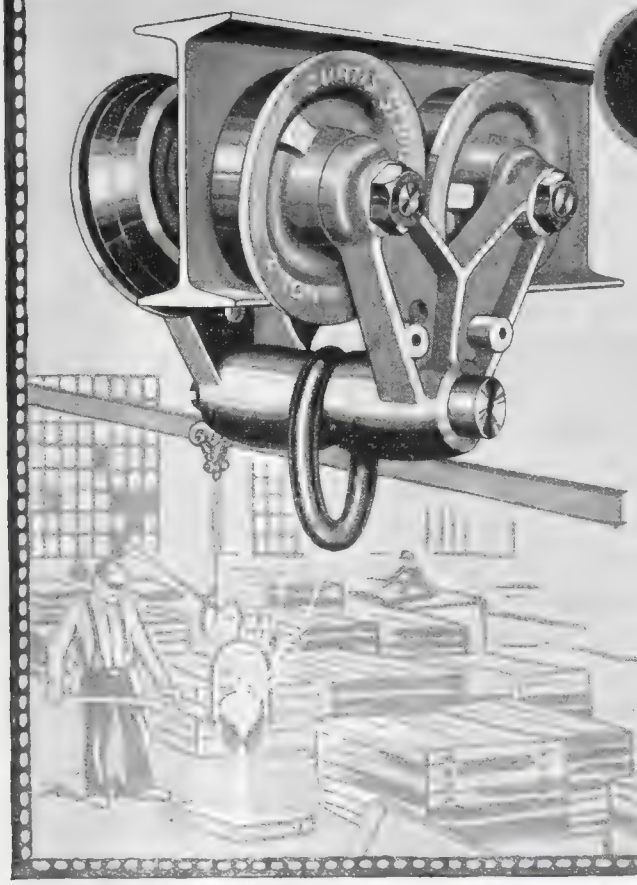
VANADIUM-ALLOYS STEEL CO.

General Sales Offices: Pittsburgh, Pa. Works: Latrobe, Pa.

BRANCH OFFICES:

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CURTIS TROLLEYS

Increase Production—Save Man-Power

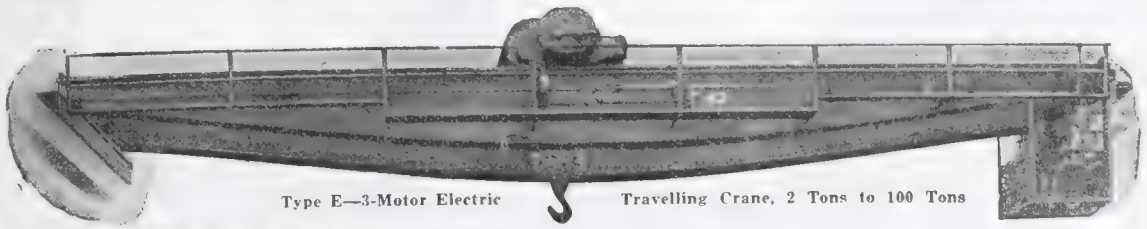
CURTIS Single I-Beam Trolleys are being used by progressive firms demanding the highest operative efficiency. A Curtis Hyatt Roller-Bearing Trolley with a 4000-lb. load can be moved by a 50-lb. pull, while ordinary trolleys require nearly twice as much power to move the same weight.

Curtis Trolleys are constructed with large inclined wheels and self-equalizing steel side-frames—so that each wheel always bears its rightful proportion of the load. They are equipped with shock-absorbing Hyatt flexible Roller Bearings—which make the trolleys easy-starting, easy-rolling and long-lasting. Full information and descriptive literature on request.

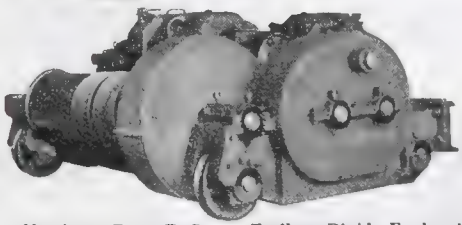
CURTIS PNEUMATIC MACHINERY CO.
1585 Kienlen Avenue St. Louis, U. S. A.
Branch Office
2-A Hudson Terminal, New York City

CANADIAN MADE CANADIAN MADE

Electric and Hand Traveling Cranes

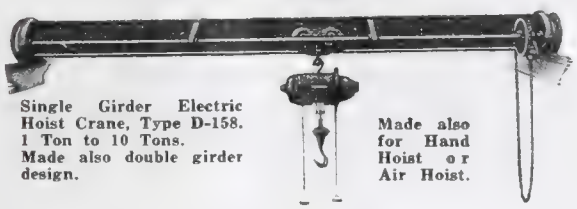


Type E—3-Motor Electric Travelling Crane, 2 Tons to 100 Tons



Northern Type E Crane Trolley, Rigid, Enclosed Construction. Patented in Canada.

We make a wide range of CRANE and HOIST designs. All sizes and capacities, 1 ton to 100 tons.



Single Girder Electric Hoist Crane, Type D-158. 1 Ton to 10 Tons. Made also double girder design.

Made also for Hand Hoist or Air Hoist.

Get our prices and specifications before you buy.

In asking prices, state SERVICE, CAPACITY, SIZE OR SPAN POWER, and, if electric, KIND OF CURRENT.

Catalogs free.



Type D Electric Hoists —½ to 10 Tons.

Air Hoists, Trolleys and Tracks.



Type No. 20 Air Hoist.

Northern Crane Works, Limited

Walkerville, Ontario, Canada

HIT OR MISS GRINDING HAS NEVER YET PAID

THIS idea of using a grinding wheel just because it is a grinding wheel is poor business. Using the right wheel in the right place is good business.

It is the only way to show increased production and a consequent reduction in the cost of grinding.

If you are grinding malleables or steel castings, your grinding sense tells you to get a wheel that is hard, sharp, and fast cutting—a tenacious sort of wheel that stands up yet cuts fast.

In other words an Aloxite Wheel.

If it is a case of grinding cast iron, brass, bronze or aluminum it's an entirely different sort of wheel you need. A wheel that is hard, sharp, fast cutting, but of an entirely different nature.

In other words a Carborundum Wheel.

When it comes to recommending certain grits and grade for your particular work our service department will see to it that you get

The Right Wheel in the Right Place



THE CARBORUNDUM COMPANY

NIAGARA FALLS, N. Y.

NEW YORK CHICAGO BOSTON PHILADELPHIA CLEVELAND CINCINNATI PITTSBURGH GRAND RAPIDS MILWAUKEE

No Lifting or Movement of the Work

The illustration below shows the Heald 10-in. x 32-in. Flat Magnetic Chuck on planer work. It is taking a chip 5-16 in. deep with 5-32-in. feed at 60 feet per minute table speed, with no tendency to lift or move on the chuck.

HEALD MAGNETIC CHUCKS

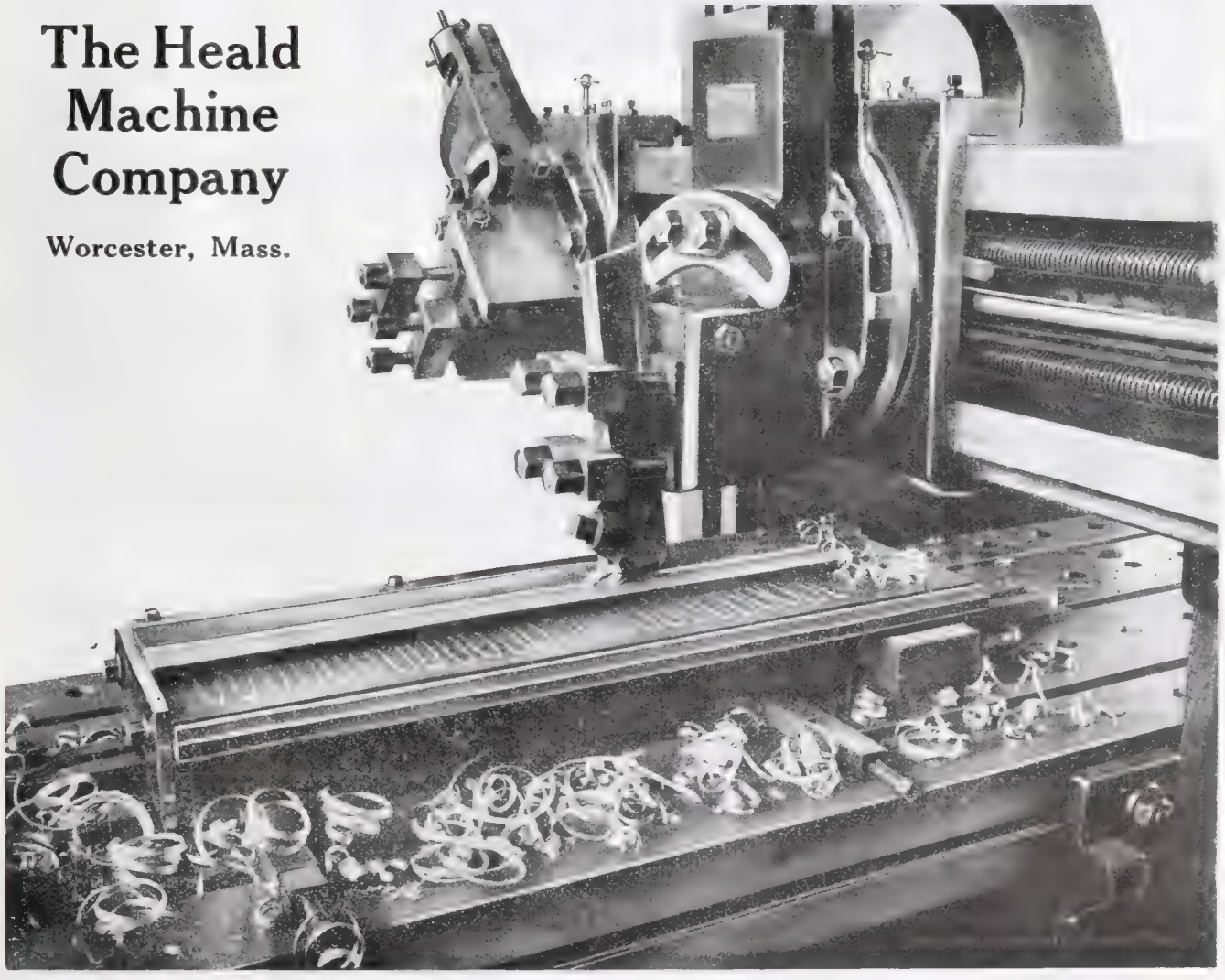
have great holding power, and consequently permit heavy cuts, coarse feeds and rapid work speeds.

All Heald standard rectangular chucks have both ends accurately machined so they can be placed end to end for holding long work. When grouped together they can be wired so as to be controlled either separately or together.

Ask your local machine dealer for bulletins No. 371 and 372, and other information.

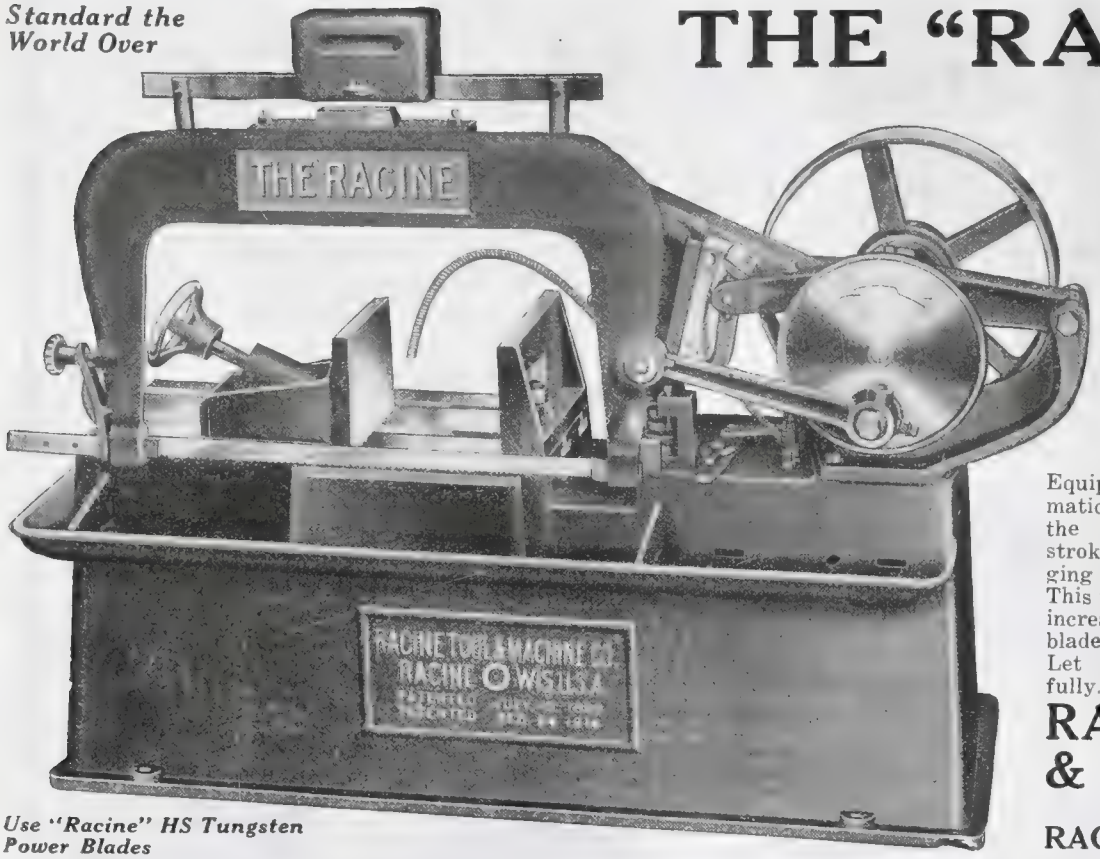
The Heald Machine Company

Worcester, Mass.



Standard the World Over

THE "RACINE"



Use "Racine" HS Tungsten Power Blades

The Machine for High Speed Metal Cutting

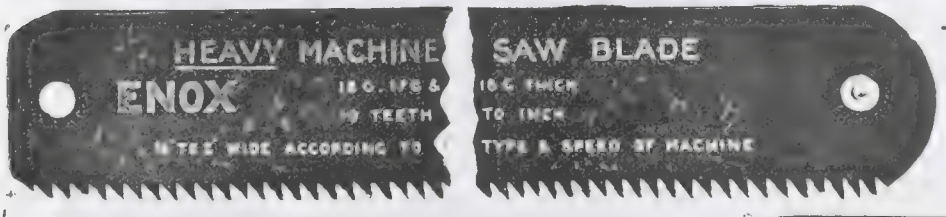
To successfully meet competition in the future you must adopt modern machines; machines that mean **quality** as well as **quantity** production. The RACINE is the tool you need. It increases speed, minimizes waste, reduces cost and is absolutely accurate.

Equipped with patented automatic lifting device which raises the blade of the non-cutting stroke and eliminates all dragging and strain on the blades. This means a saving in material, increased speed, long life for blades and greater production. Let us explain the machine fully. Write.

RACINE TOOL & MACHINE CO.
Melbourne Avenue
RACINE, WIS., U.S.A.

SIMONDS
HACK SAW BLADES
UNEQUALED IN QUALITY ANY SIZE OR LENGTH

Simonds Canada Saw Co. Limited
ST. JOHN MONTREAL VANCOUVER



ENOX
Hacksaw Blades
ARE THE BEST

AGENTS IN CANADIAN TOWNS WANTED

Liberal Terms offered to firms willing to carry stocks and act as sole agents for the district.

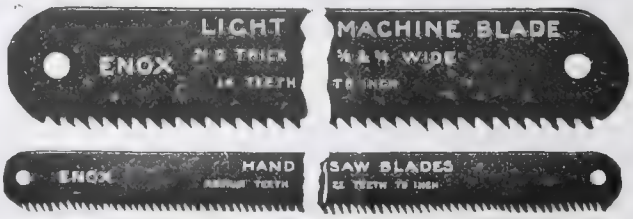
Makers:

FRY'S (LONDON) LIMITED

AN ENTIRELY BRITISH COMPANY

46 Upper Thames St., London, E.C. 4, England. Works: Greenwich, S.E. 10

Agents for Canada, East of Fort William



THE STANDARD MACHINERY & SUPPLIES, LIMITED, 261 Notre Dame St. West, MONTREAL, QUE.

Agents for British Columbia—The A. R. Williams Machinery Co., Limited, 495 Railway St., Vancouver, B.C.

The Starrett Combination Saw—Chart—Machine

Will Increase the Efficiency of Your Cutting-off Department.

The Starrett Saws do the most work in the least time, because there is a blade for every metal cutting requirement.

The Starrett Chart tells you quickly which is the proper blade to use. You can depend upon it because it is based on exhaustive tests.

The Starrett Machine cuts on the draw stroke; automatic locking device prevents saw dragging. Adjustable for stock from 1″ to 6″ in diameter.

Send for the Starrett Chart 3 and Machine Folder No. 950.

The L. S. STARRETT CO.

The World's Greatest Toolmakers

Manufacturers of Hack Saws Unexcelled

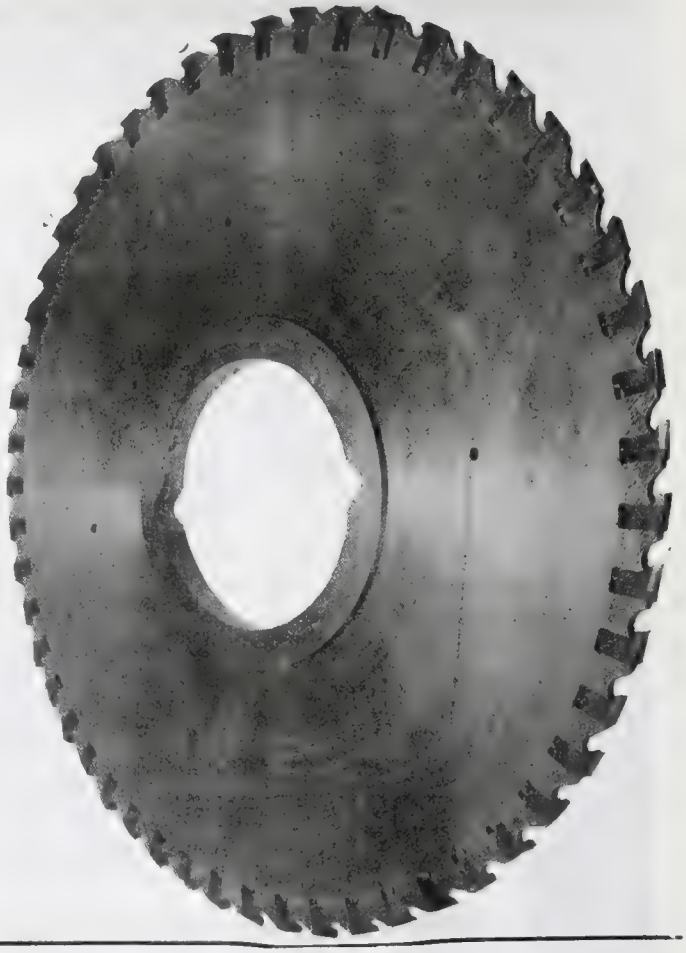
ATHOL, MASS.
NEW YORK, LONDON
CHICAGO

42-928



90-inches
in diameter

Cut on right shows a Hunter Duplex Inserted Tooth Saw used by the Erie Forge Co. for cutting gun forgings. It is the largest inserted tooth saw blade we know of ever having been made in the United States or any other country —1" plate, 1 5/16" kerf, and contains 56 high-speed steel teeth, and weighs approximately 3,000 lbs.



Hunter Duplex Saws

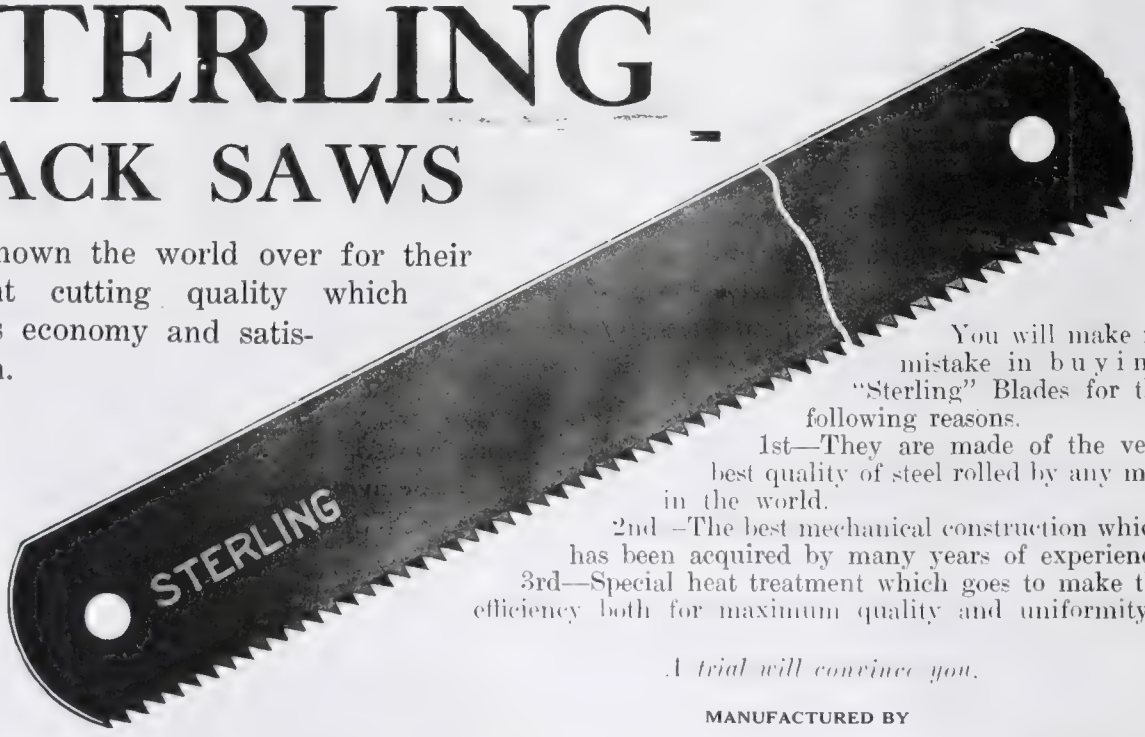
No matter what your sawing requirements may be, there is a Hunter "Duplex" Saw that is just right for the work. The discs are made of Chrome-Vanadium Steel, oil treated.

Hot Saws, Friction Discs, Solid Blades made of Vanadium, Tungsten and Chrome Alloy Steels. Saw Sharpening Machines. Inserted Tooth Grinders. Hardened Steel

Hunter Saw & Machine Co.
Pittsburgh, Pa., U.S.A.

STERLING
HACK SAWS

Are known the world over for their efficient cutting quality which insures economy and satisfaction.



You will make no mistake in buying "Sterling" Blades for the following reasons.

1st—They are made of the very best quality of steel rolled by any mill in the world.

2nd —The best mechanical construction which has been acquired by many years of experience.

3rd—Special heat treatment which goes to make the efficiency both for maximum quality and uniformity.

A trial will convince you.

MANUFACTURED BY

Diamond Saw & Stamping Works
BUFFALO, N.Y., U.S.A.



CUT YOUR CUTTING COST WITH VICTOR Flexibles

The high cost of tools should emphasize more than ever the importance of quality.

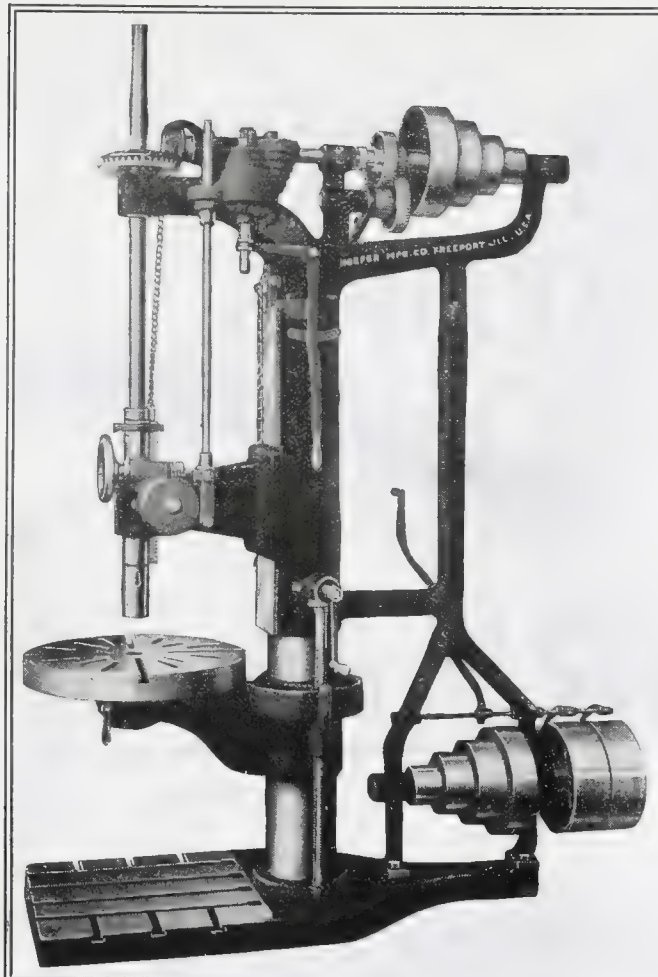
The high cost of hack saw blades ought to drive every hand blade user over to the saw that does not break in ordinary hand work.

VICTOR FLEXIBLE HACK SAW BLADES have exactly the same cutting power as the finest All-Hard on the market, and that they cannot be broken in use except by intentional abuse is an undisputable fact—which will represent a saving from twenty-five percent to thirty-three and one-third percent in breakage alone.

Seventy-five percent of the All-Hard blades used in hand frames break before they are worn out. Watch the All-Hard blades in your own shop and see the enormous amount of breakage—then use VICTOR FLEXIBLES and note the economy.

VICTOR SAW WORKS LTD - HAMILTON, CANADA

VICTOR HACK SAWS



HŒFER

for PRECISION DRILLING

For over 25 years the name Hoefer has been associated with drilling equipment. Drillers have been our specialty.

Hence it is only natural that Hoefer Drillers should embody the latest word in design, efficiency and accuracy.

And they do. Regardless of the size of press, drilling to a fine degree of precision is always possible.

Hoefer Drillers are looked upon as a recognized standard—the standard by which satisfactory service can be measured.

Catalog showing complete line on request.

HOEFER MFG. CO.

FREEPORT - ILL.

DRILLERS

A WALL RADIAL DRILL

That Puts Dollars In Your Pockets

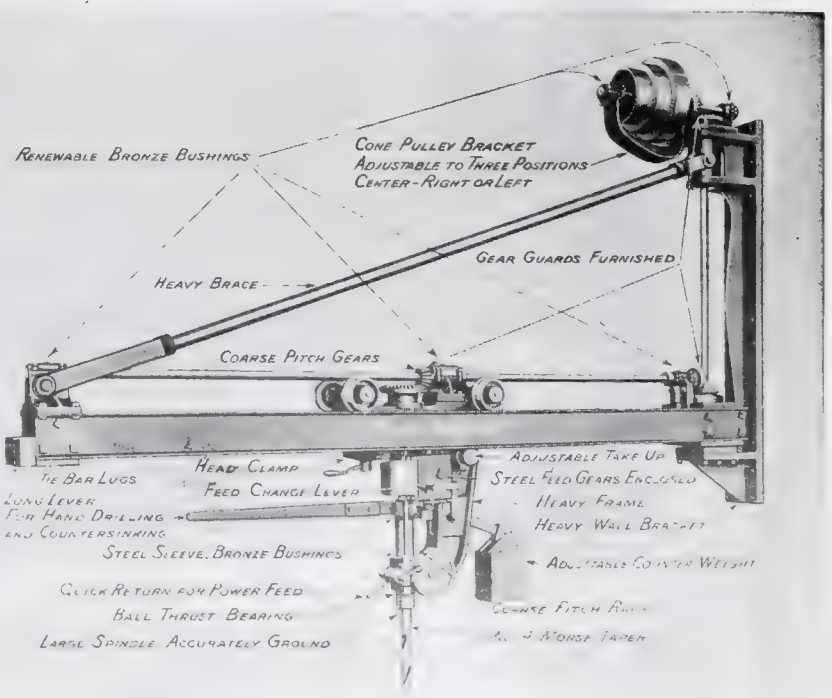
Here's a real machine tool in the wall radial drilling line for your consideration. Listen to this—the machine is made of high grade materials throughout and the workmanship is beyond criticism. It is designed with the particular idea of maximum production, at a minimum operating expense. Entire control within easy reach makes the operators "boosters" for these machines. You can keep the dollars that may be slipping away on your wall radial drilling proposition in your pocket, by the installation of this machine.

Send for detailed bulletin.

MADE IN FOUR STANDARD SIZES

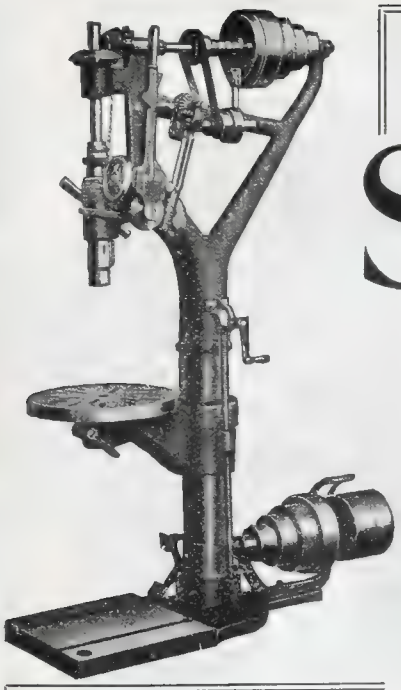
Rated size	Drills to center of	Wall to end of arm
7 ft.	14 ft. circle	10 ft.
9 ft.	18 ft. circle	12 ft.
11 ft.	22 ft. circle	14 ft.
13 ft.	26 ft. circle	16 ft.

F.O.B. Boston, Mass.



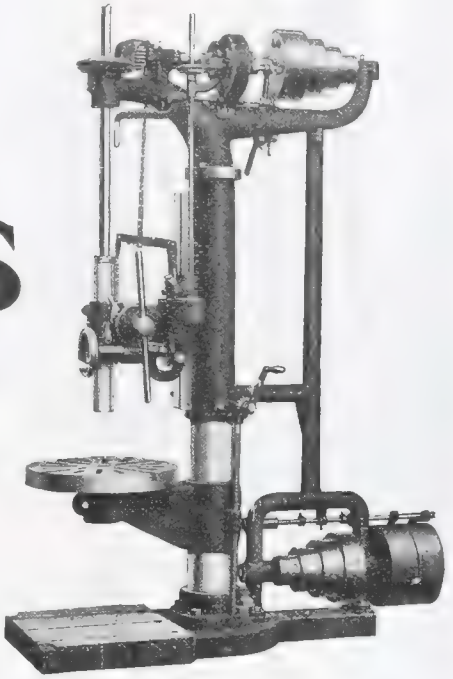
LYND-FARQUHAR COMPANY

419-425 Atlantic Avenue **BOSTON, MASS.**



Meet the keen competition of peace times by putting into your shop faster, stronger and more accurate upright drilling machines. Sixty-four years' drill building experience is back of these perfected

Silver Drills



The 25" Silver Drill has eight spindle speeds and six positive geared feeds. The 20" Silver Drill is built in four distinct styles with round or square base. Furnished singly or in gangs of 2, 3 or 4 spindles.

Write for further facts.

The Silver Mfg. Co.

290 Broadway

SALEM OHIO

Prompt Deliveries

H. COLLIER SMITH

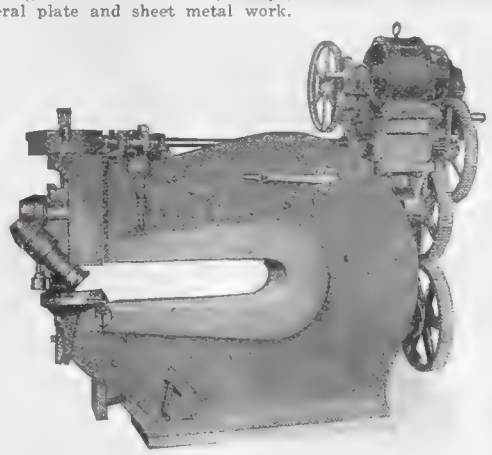
"QUICKWORK"

Registered U.S. Patent Office

ROTARY SHEARS

Made in 6 Sizes

Cut all gauges of sheet and plate metal up to 1 inch thick in straight or irregular shapes and openings without cutting in from side of sheet. Leaves square, true edge that requires no finishing. Used in building ships, boilers, tanks, cars and general plate and sheet metal work.



Patented June 3rd, 1913

SAVES 50% TO 90%

Eliminates Oxyacetylene Cutting and Plate Planing

Write for Catalogue

THE QUICKWORK COMPANY, ST. MARYS, OHIO, U. S. A.

Ten Speeds Ranging from 268 to 2140 R.P.M.



The Albany high-speed drill is provided with every means for the rapid and accurate drilling of all kinds of work. For rapidity of stopping and starting of spindle; for quick change of drills, chuck and speeds, and for accurate drilling to depth, it is decidedly distinctive. With an index of drill speeds on head and a micrometer gauge for depth as part of the machine, the average operator is enabled to get those good results that are usually attained only by experts.

FOREIGN AGENTS. F. W. Horne & Co., Tokyo, Japan, China, Korea. R. L. Scrutton Co., Ltd., Sydney, Australia and New Zealand. Litton's Machine Tool Co., London, England. A. Berthoin, Grenoble, France. V. Lowner, Copenhagen Denmark. Aktiebolaget, Rylander, Asplund, Stockholm, Sweden. Gillespie Bros. & Co., South Africa (New York City). Monti & Oscuro, Milan, Italy.

Details will show why. Shall we send them?

ALBANY HARDWARE SPECIALTY MFG. CO.

ALBANY WISCONSIN

"CANADIAN"

ACCURATE work demands accurate and efficient tools.

The Canadian No. 5 has some features worth considering.

Eight speeds, three power feeds—also hand and lever feeds.

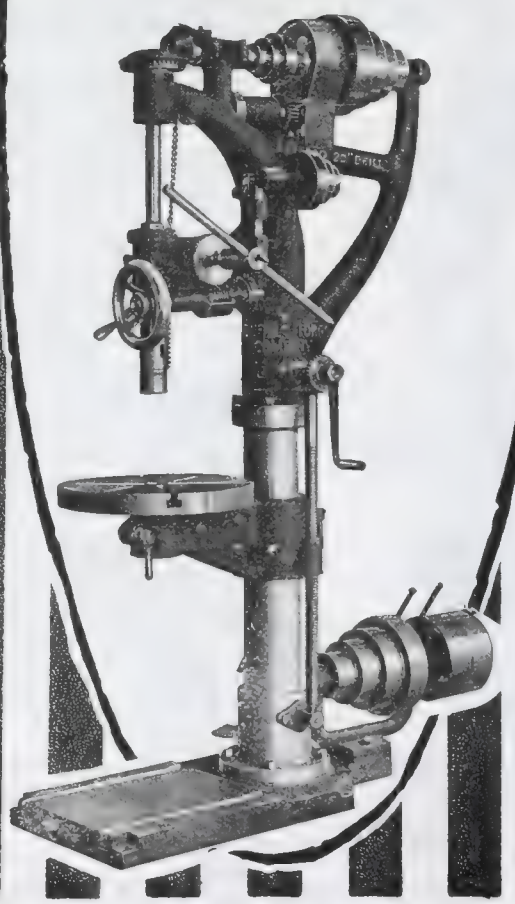
The twist of a knurled knob changes instantly plain drive to back geared drive—no tools to get lost or bother with.

An adjustable automatic trip throws out power feed when piece has been drilled to required depth.

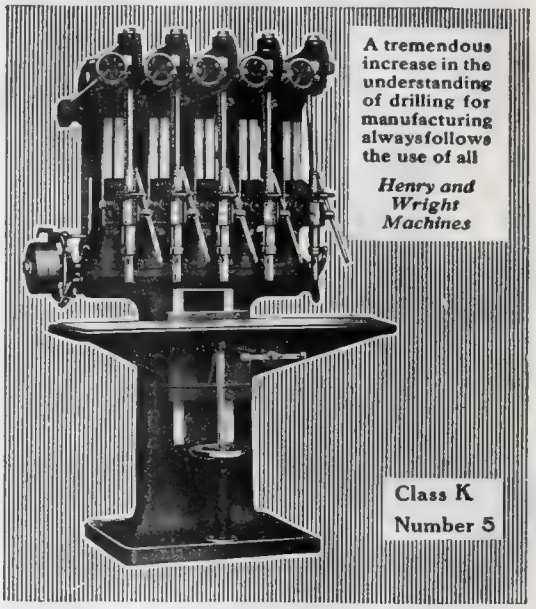
Split adjustable bearings, ball bearing graduated spindle—but then there are so many features—for complete description write for literature.

Circular 1199-16 describes the whole Canadian Upright Series

Canadian Blower & Forge Co., Limited
Kitchener, Ontario



HENRY & WRIGHT
Drilling Machines



A tremendous increase in the understanding of drilling for manufacturing always follows the use of all *Henry and Wright Machines*

Class K
Number 5

The Henry & Wright Mfg. Co.
Hartford, Conn.

Canadian Fairbanks-Morse Co., Montreal, Toronto, Winnipeg; A. R. Williams Machinery Co., Toronto, St. John, N.B.; H. W. Petrie, Ltd., Toronto; Williams & Wilson, Montreal; Rudel-Belnap Machinery Co., Montreal; Canada Machinery Corp., Galt, Ont.; Geo. F. Foss Machinery & Supply Co., Montreal; General Supply Co., Montreal.



WE BUILD THEM BY HUNDREDS

Standardized Production enables us to offer this powerful Waterbury Grinder at such a low price. It grinds rapidly and accurately, all flat surfaces, dies, punches, planer, lathe, and other tools. Has adjustable table and tool rest with large radius of travel. Rigid, 3-point table supports giving great steadiness. A reliable, practical grinding outfit.

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3—No. 613 Defiance-Wood-turning Lathes.

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1—No. 12 Pratt & Whitney Gear-driven Profiler.

1—No. 3 Garvin Plain Hand Miller.

2—No. 1 Standard Hand Millers.

1—Globe Universal Tool and Cutter Grinder.

3—No. 2 Eureka Metal Jig Saw.

1—12 x 12 Sullivan Air Compressor with unloader, Class WG3.

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1—No. 6 Diamond Disc Grinder with 26″ Disc.

1—No. 1 Gray Sheet Metal Cutter.

1—18″ x 10′ bed Hendey Lathe.

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2—2-Spindle Allan Drill Presses, Hand Feed.

2—3-Spindle Allan Drill Presses, Hand Feed.

10—Rickert Shafer Tapping Machines.

3—No. 6 Whitney Hand Millers.

2—No. 4 Warner, Swasey Screw Machines, geared friction head with power feed to turret, automatic chuck bar feed.

7—No. 2 Warner, Swasey Screw Machines, geared friction head with power feed to turret, automatic chuck bar feed, plain head.

1—No. 1½ x 9 Acme Screw Machine, power feed to turret.

3—No. 1 Foster Plain Head Screw Machines, with automatic chuck.

4—No. 2 Foster Geared Head Screw Machines, with automatic chuck, bar feed power feed to turret.

4—No. 4 Foster Geared Friction Head Screw Machines with automatic chuck wire feed.

1—½″ Landis Double Head Bolt Cutters.

1—16″ Cincinnati Shaper, NEW.

1—15″ Potter & Johnson Shaper, NEW.

2—No. 730½ Brown-Boggs Geared Press.

Miscellaneous Items

1—60 H.P. Westinghouse Motor, 3-phase, 25-cycle, 550-volt, 720 R.P.M., with bedplate, pulley and starter; NEW.

1—42″ Cameron Combination Model No. 24 Slitting Machine.

1—20 M lbs. Olsen New Universal Wire Testing Machine, hand-operated, arranged to test tensions and compressions up to 8′, with regular equipment.

4—Mattison Balancing Tools.

Canadian Aeroplanes Limited

Dufferin and Lappin Avenue **TORONTO**

WILSON FEARED THE BRITISH

THE American President crossed the Atlantic in the first place with the idea in his mind that his ideals would be thoroughly in accord with those of the French statesmen; but he was rather afraid of a conflict with the British delegates. He found in reality that his plan for peace terms was as far removed from the French plan as the two poles. Then he crossed to London and was surprised to find that the ideas of the two Anglo-Saxon powers were identical.

This situation, according to J. W. Dafoe in the May issue of MACLEAN'S MAGAZINE, explains much that has developed at Versailles. Further, it contains the promise of a close *rapprochement* between the two great English-speaking democracies for all time to come.

Mr. Dafoe has contributed a remarkably interesting article to this number of MACLEAN'S, lifting the curtain on many of the puzzling situations that have arisen overseas. As the editor of the Manitoba *Free Press*, he is the dean of Canadian newspapermen; as the representative of the department of Public Information on the Canadian Mission to the Peace Conference, he was in a special position to learn what was transpiring. He tells of the really big part that Canada has played in the Proceedings and points out that Canada's status as a nation was firmly established in the eyes of the world when she was allowed separate representation.

A Dozen Other Features---Nationally Important

This May issue is full of articles of unusual significance for Canadian readers.

"SOLVING THE PROBLEM OF THE ARCTIC"
—By Vilhjalmur Stefansson

The second instalment of his remarkable story of the four years of exploration that he undertook for the Canadian Government in the region of the "Pole of Inaccessibility"—a harder place to reach than the North Pole.

"ORGANIZING FOR PEACE"
—By George Pearson

An article of the Great War Veterans' Association by a well-known author-soldier.

"THE CANADIANS IN SIBERIA"
—By Capt. W. E. Dunham

A graphic story of what our forces did in combatting the Bolsheviki, by an officer who has just returned.

"SAFE IN THE SADDLE"
—By J. K. Munro

A review of affairs at Ottawa in which the opinion is expressed that Union Government for the time being is safely entrenched.

Four capital stories by famous authors—W. A. Fraser, Lloyd Osborne, Frederic S. Isham and C. W. Stephens.

The National Idea

The articles in this issue of MACLEAN'S reflect the national idea—Canada's part in the Peace Conference, the political situation at Ottawa, the exclusive report of Stefansson's national explorations, the national organization of our returned men, the work of our forces in Siberia. The reader of MACLEAN'S gets a broad idea of what Canada as a whole is doing. The value of this issue— and of all issues is very great, therefore, from an educational standpoint.
MACLEAN'S is the one magazine that should be selected for young Canadians to read.

The Review of Reviews

An unusually fine array of articles is given in this department, selected from the best in magazines and periodicals the world over. Some of the titles are:

Planned to Destroy British Fleet.
How Mackensen Was Caught.
Events of War Foretold by Stars.
What is Life Like Beyond the Grave?
A High-born Bolshevik
The New Life in Dry America.
Germans Were Ready to Capitulate.
Japan's New Foreign Policy.
The Many Kings of Jerusalem.
Is British Foreign Office Against League?
Ambassador Tells Story of Peace Ship.
Hindenburg—After the Armistice.

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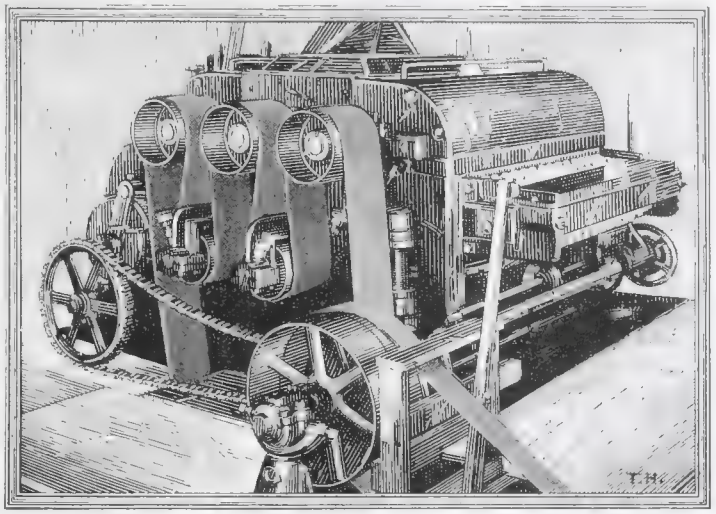
MAY ISSUE *Now On Sale At All News Dealers*

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This illustration shows a Graton & Knight veteran in a Spartan Double Belt, 46 feet long and 8 inches wide. It is running every day in the plant of the Leroi Furniture Company, St. Louis, Mo. It has seen 4½ years of service. This belt-eating sanding machine wore out three 9-inch ordinary belts in eighteen months. Its cost has been 40 cents a week with long service to come.



For all drives designed in our Engineering Department the belts are proportioned so that the stress, due to the horse-power being transmitted, is never more than one-tenth of their ultimate strength. The rules employed are the result of extensive experience, and applied to your problems may show that you are using a belt too good or one not good enough for the work to be done.

The Right Belt in the Right Place

Here is punishment for *any* belt. And as usual SPARTAN is the belt that is game for it. It shows the right belting material in the right place. SPARTAN, greatest of pulley-grippers, flexible and elastic, is solving the problem of the trouble-making drive in thousands of plants. There is one answer and one reason—leather properly tanned and fabricated for a given purpose—a Standardized Series.

You can't think of any belting material that stands hard knocks the way leather does—or one that can be satisfactorily spliced or repaired. Leather has the tightest of frictional grip. It gives and takes as the need arises. It doesn't fray under the side slapping of shifters. After a long and useful life on main drives you can cut it into smaller belts and keep it earning money.

Graton & Knight Standardized Series Belts are made for the work to be done—from the first step in tanning. Very nearly 300,000 steer hides pass through our hands yearly. Think of the broad selection that gives us, the uniformity of quality possible. And installing any G. & K. Standardized Series Belt means the right belt in the right place—not merely a belt, but a belt for a *given* purpose.

Many of the best belted plants ask us to specify the belting for every drive. Try the plan yourself. Then, when buying, call for "Graton & Knight Brand—or equal." This won't commit you to buying our belts. It will put your buying on the one basic consideration—the work to be done.

Write for information about Standardization as applied to Belting

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Oak Leather Tanners, Makers of Leather Belting, Lace Leather, Leather Packings and Specialties

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LEATHER BELTING

Tanned by us for belting use

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On Planers---
Goodyear Extra Power Belting

The final test of belt efficiency is found on both large and small high-speed planers in woodworking plants.

Planer drives are of two types, the cylinder drive and the side head drive.

Feed drives are hard to belt, as they are belted top and bottom—each belt must also run over another pulley, which allows the roller to turn and move the board ahead, as it is planned.

The side head drive is found the most difficult to belt, because of the maintenance of exceptional high speed, the difficulty of installation, and the necessity of stretch elimination. Sidehead belts operate by two-quarter turns on the under side from a vertical shaft to a horizontal pulley. To make these turns, two idlers are necessary, running the belt over four pulleys—each sidebelt in contact with two pulleys.

It is with real satisfaction that we receive testimonials of the exceptional service by Goodyear Extra Power Belting on work of this kind.



The Crow's Nest Lumber Company, of Wardner, B.C., operate a Berlin type side-head matcher and resaw equipped with a 5-inch, 5-ply Goodyear Extra Power—it has a record of eleven months' continuous service.

Mr. Laird, Superintendent, says: "No trouble whatever has been experienced. Extra Power has been entirely satisfactory, giving a greater service than had ever been secured in the mill."

Mr. Laird adds that, while this particular record is outstanding, Extra Power has given splendid results through the mill on all types of machine, countershaft and main drives.

Belt men trained by Goodyear are at the service of any industrial in Canada. Discussing your problems with Goodyear places you under no obligation. Phone, wire or write the nearest branch.

The Goodyear Tire & Rubber Co. of Canada, Limited

Branches: Halifax, St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, London, Winnipeg, Regina, Calgary, Edmonton and Vancouver.

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EXTRA POWER BELTING

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The following is a report from one of the best known plants in the country. (Name on request.)

"The man on the machine where the cutter was tested says that it is the best cutter he ever had. He says it stood up for 19 hours without stopping and then could have been put into perfect shape with a little oil stone. The best they get out of their own cutters is between 10 and 11 hours.

"The material was cast steel, full of sand holes and chilled spots; the feed, 5/8-110-40."

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We will supply Davidsonized High Speed Steel Blanks, in the semi-finished state, hardened and finished within grinding size (about .01" to .020 stock to be removed from working surfaces). This service enables the user to obtain these tools of unequaled quality at a cost which compares favorably with that of tools made from the solid bar.

THE greater your outlay for materials, the more necessary to turn them back into money as rapidly as possible.

The greater your outlay for labor, the more important to get every possible cent's worth of value from it.

Faster production is the answer; and the way to the faster production is by

DAVIDSONIZED HIGH SPEED STEEL TOOLS

Actual performance in many plants which rank among the largest-scale producers in the world, is our authority for the blunt statement that

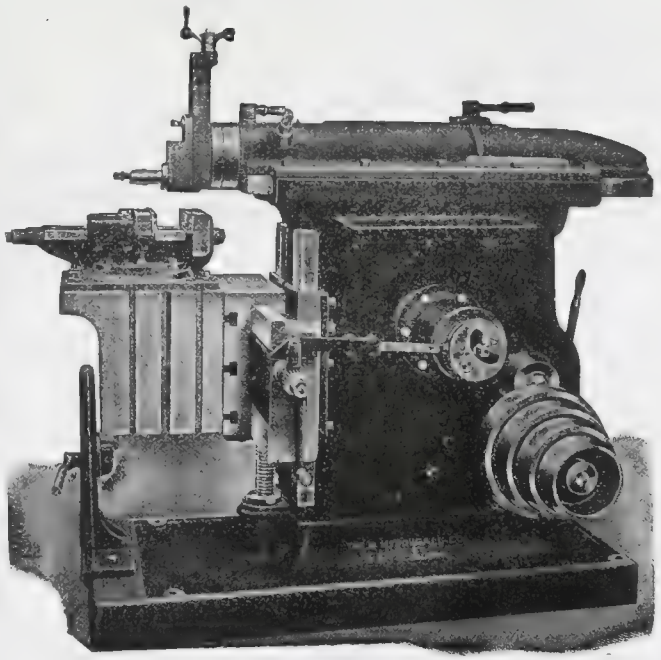
Davidsonized Tools will give you more pieces per hour and more pieces per grinding than any other tools you are using or ever have used.

There is a flat, unconditional guarantee back of that statement. If the tools do not outperform those you make yourself or buy elsewhere, return them and we will cancel all charges.

As a matter of fact, these Davidsonized Tools, produced by an altogether new process which represents a radical advance over previous high-speed steel practice, have made a record in actual use which promises to revolutionize production standards. You should know about this. Correspondence invited.

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An examination of the construction will reveal features that make for increased production, ease of operation and accuracy.

Write for descriptive literature.

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One every second is a speed which this Grant Rivet machine will keep up indefinitely, in any degree of tightness or looseness desired. Each rivet is finished with perfectly shaped head, polished and with no hammer marks showing.

We claim this is the only machine manufactured that will accomplish this feat. Our claims are unchallenged. By writing for our catalogues you may obtain full information regarding the ability of this machine.

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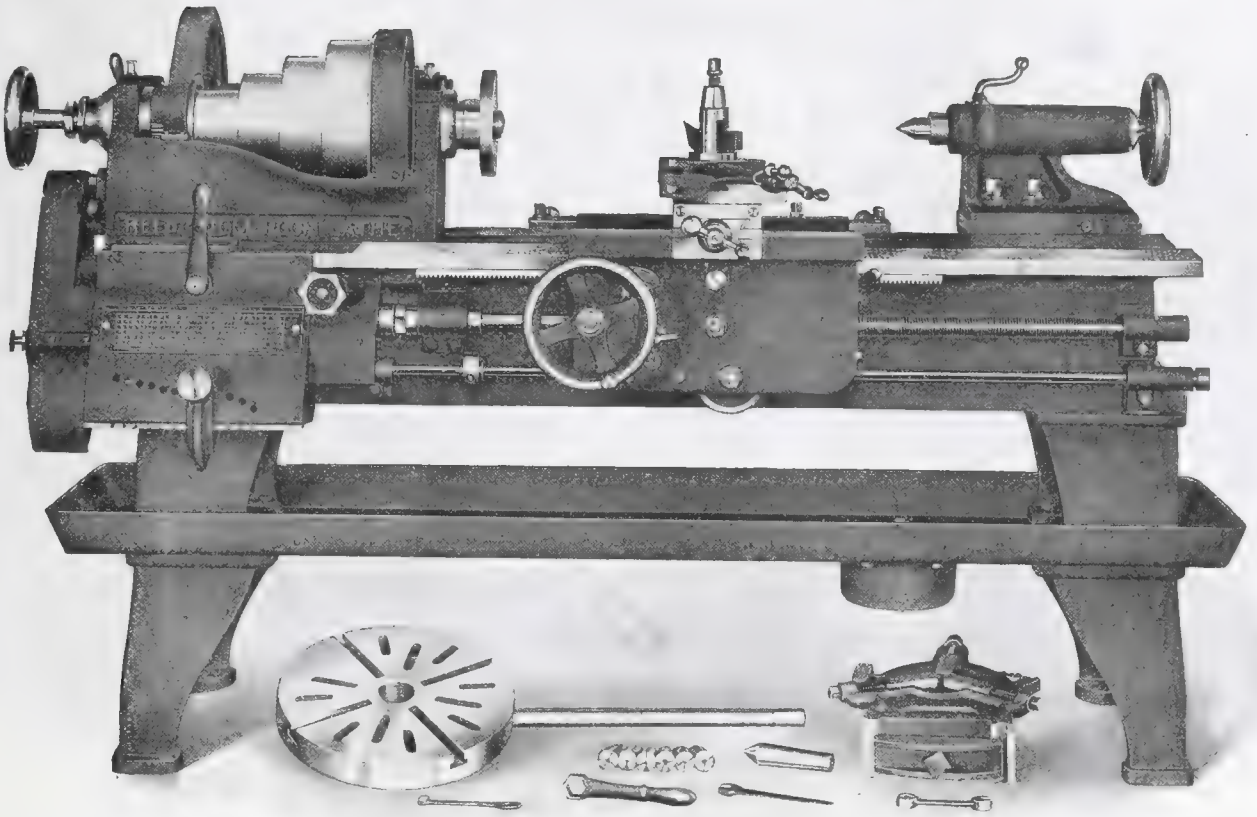
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"REED" ACCURACY

YOU CAN TRAVEL PRETTY MUCH ALL OVER THE WORLD AND FIND MEN WHO HAVE AT ONE TIME OR ANOTHER USED "REED" LATHES.

WERE YOU TO ASK THEIR OPINION OF THIS MAKE OF MACHINE YOU WOULD UNDOUBTEDLY BE IMPRESSED BY THE UNIVERSAL REPLY—"ACCURATE."

THERE IS ONLY ONE WAY OF GETTING ACCURACY OUT OF A MACHINE TOOL. IT MUST BE PUT THERE DURING THE MAKING. WE DO THAT.

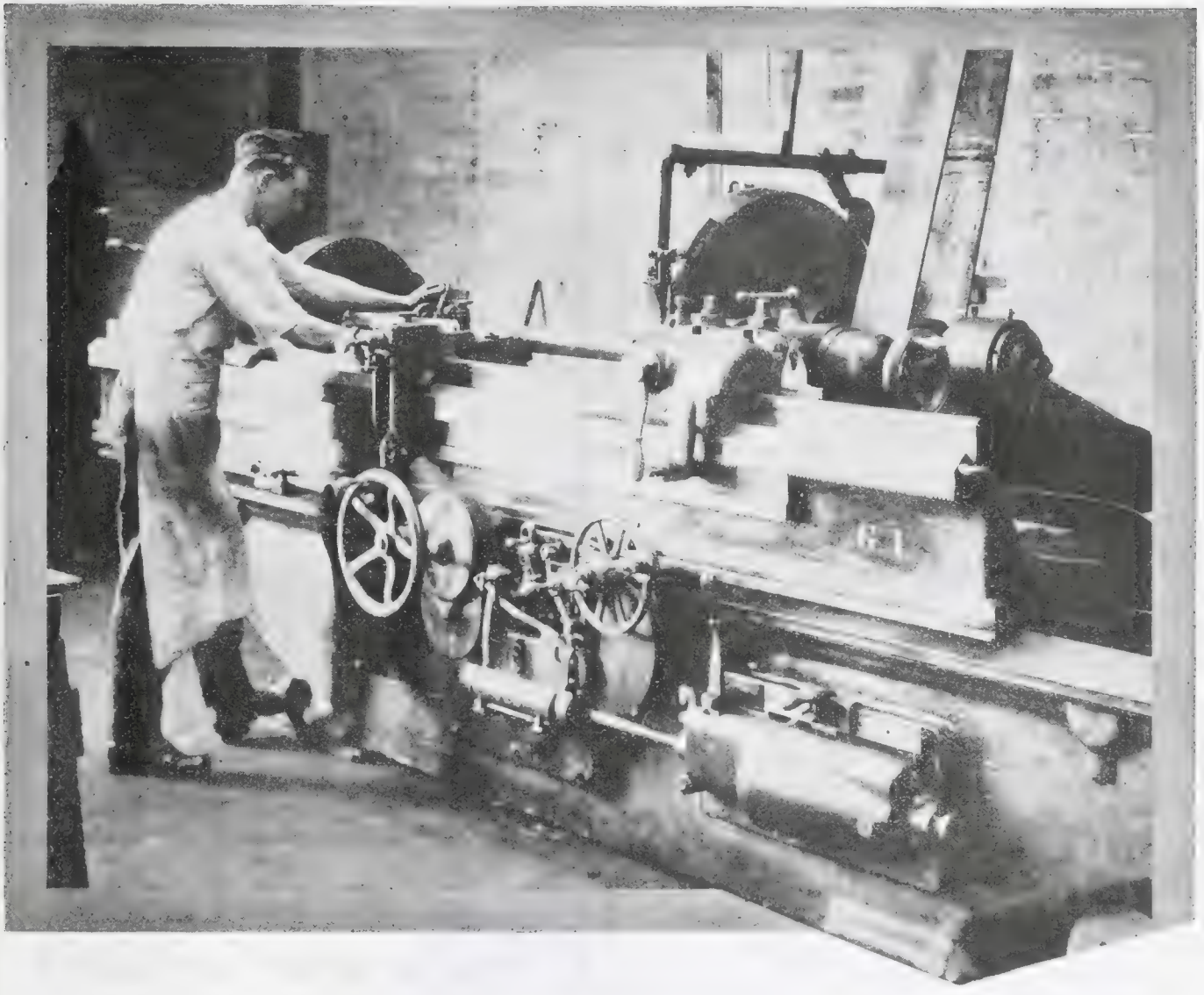
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N-219

ing Machines

Notes on Grinding
NORTON COMPANY, WORCESTER, MASS.

No. 40A

The Snagging of Annealed Malleable Iron Castings

Machines Used

The annealed white iron or malleable iron castings are usually ground on floor stands with 1½″ or 2″ spindles. Occasionally small castings are ground on bench stands mounting 10″ or 12″ diameter wheels, 1″ to ½″ thick, with 1¼″ hole. Also some of the heavier types of castings are more conveniently ground by means of swing frame grinding machines. In this case, 18″ to 24″ diameter wheels are used down to about 14″ diameter, when they are transferred to floor stands for smaller castings, and thus used down to about 8″ diameter.

Question of Abrasive

The surface, at least, of malleable cast iron is essentially a low carbon steel and has similar physical properties. Therefore, this automatically determines that the proper abrasive is Alundum or some aluminous abrasive.

Sizes and Shapes of Wheels

In a majority of cases straight wheels are used, but we find quite a few bevelled wheels, tapered both sides ½″ and ¾″ per foot, in service. As it is usually possible to have the wheel guarded by a protection hood, there is no real reason for the use of the bevelled wheel. Such wheels cost more to make and command a higher price than a straight-sided wheel of the same diameter.

The following sizes are considered good practice on floorstands:

Diameter	Thickness	Diameter Arbor Hole
14″	1½″-2″	1½″
16″	1½″-2″ -2½″	1½″
18″	2″ -2½″-3″	1¾″
20″	2″ -2½″-3″	2″
24″	2″ -2½″-3″	2″

NORTON COMPANY

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., Montreal Toronto, Ottawa, St. John, N.B., Winnipeg, Calgary, Saskatoon, Vancouver, Victoria. F. H. Andrews & Son, Quebec, Que
Grinding Wheel Plants, Worcester, Mass.
ELECTRIC FURNACE PLANTS NIAGARA FALLS, N. Y. CHIPPAWA, ONT.
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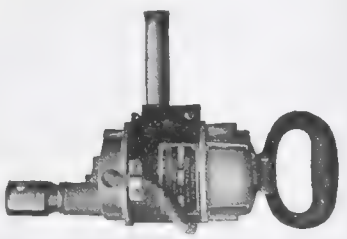


"Matthews-made" steel stamps and lettering dies make easily read and durable marks on all classes of products. Matthews Champion Type Holders—for flat and convex surfaces—with interchangeable Steel Type, save time and lower marking costs. Matthews Inspection Hammers of best Pittsburgh Steel, are fashioned with the "know how" of over 50 years' experience.

Booklet "For Light and Heavy Marking" sent on request. Write for a copy of it.

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Save Time. Labor and Money

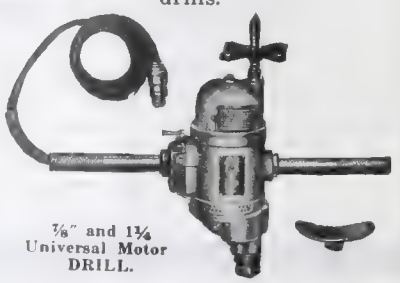


They can be attached to any lamp socket.

For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

3 SIZES
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¼ in., W.G.T. 9 lbs
⅜ in., W.G.T. 12 lbs.

All motors wound for 110 or 220 volts.
Direct or alternating current.
Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



⅜″ and 1¼ Universal Motor DRILL.

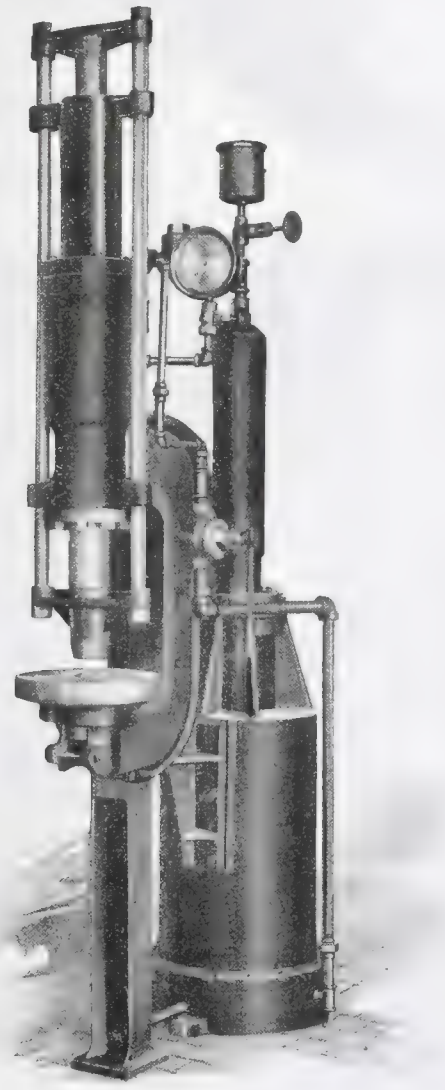
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CINCINNATI, OHIO

ORIGINALITY

is Characteristic Always of

"METALWOOD"

DESIGNS and DEVELOPMENTS



The "Metalwood" line of these Quick Operating Hydro-Pneumatic Presses comprises a variety of styles, types and sizes.

By performance through a period of years, these presses have established themselves in a wide range of industries as standard tools for light straightening, broaching, forcing and assembly operations.

The "R-149" style press of 20-ton capacity shown here is described in our bulletin B-47.

METALWOOD MANUFACTURING CO.

High Speed Hydraulic and Hydro-Pneumatic Machinery

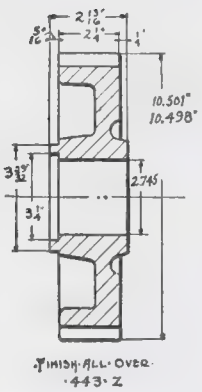
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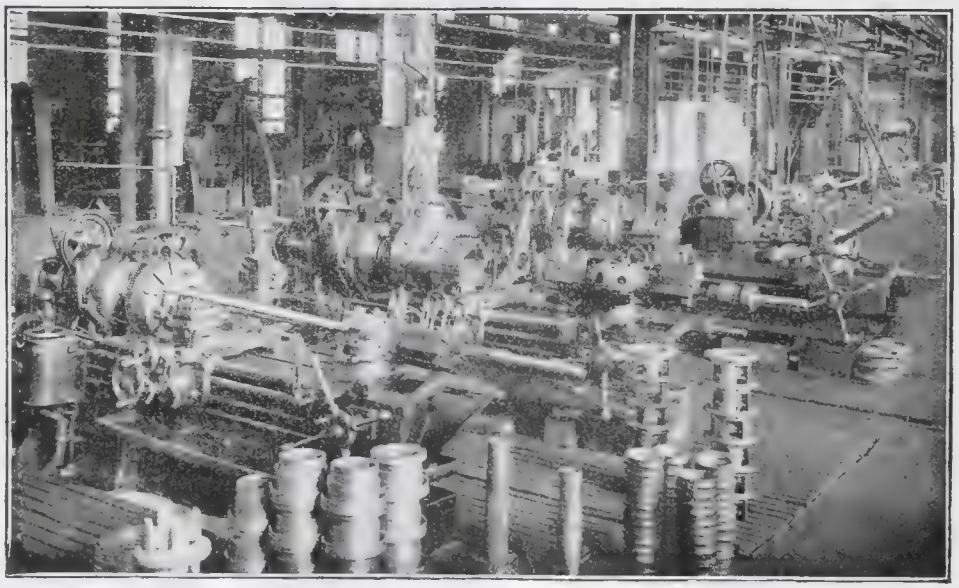
Canadian Fairbanks-Morse Co., Ltd., Montreal and Toronto; R. E. Ellis Engineering Co., 621 Washington Blvd., Chicago; Fairbanks-Morse & Co., Inc., 30 Church St., New York City; Sherritt & Stoer Co., Inc., Finance Bldg., Philadelphia, Pa.

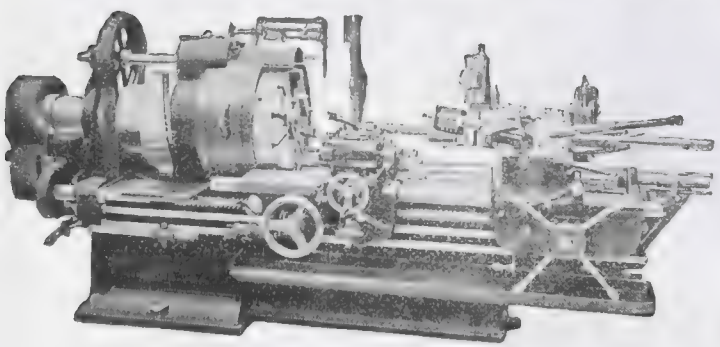
GIS

Standard Turret Lathes



Steel Plate Face Gear
35 MINUTES





Gisholt Methods Insure Accuracy and Economy

They Deliver the Results On Time All the Time

In planning your readjustment problems, let Gisholt Standard Turret Lathes supply the answer, *and the production*, for that part which concerns the use of hand operated turret machines.

Successful during many years of peace, and successful during the past years of war, Gisholt Lathes stand ready to resume normal manufacturing and to render a grade of service which is typically *Gisholt.*

A new book showing the Gisholt Standard Turret Lathes and the work they produce is ready for distribution. A copy will give you many valuable suggestions for getting the most out of the busy days ahead. Just tell us to whom we should send it.

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HOLT

Boring Mills

The days of boring through the Hindenburg line are over, but there are busy days of boring ahead in shops which must now turn their energies to the manufacturing of pre-war commodities with renewed vigor.

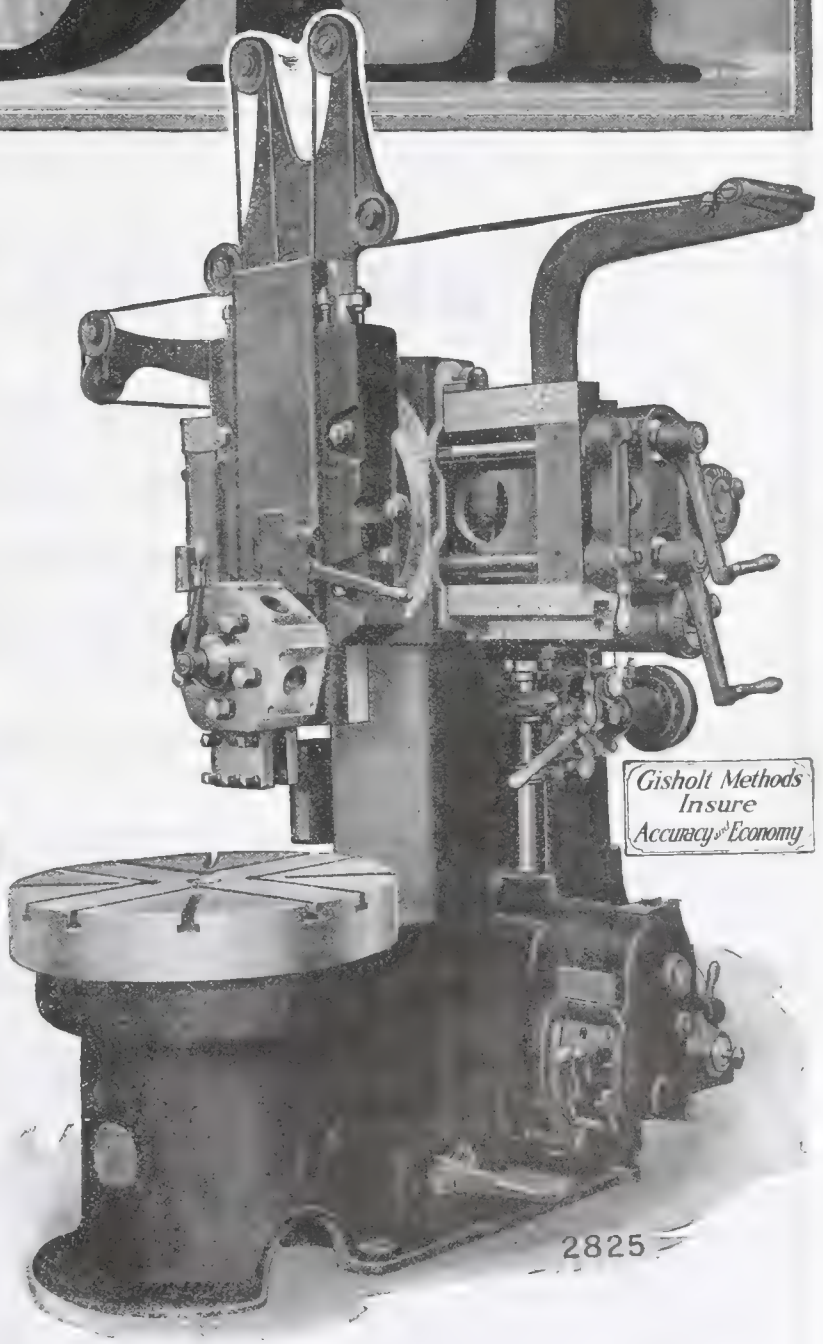
Gisholt Vertical Boring and Turning Mills assure the same successful boring tactics of our boys in France. The answer to each achievement is the same: the strength of *organization* and the *exceptional qualities* of men and *machines*.

Renewed competition calls for the best equipment on your part to meet it. Gisholt Boring Mills, like *every* Gisholt product, assure tangible results which represent the outcome of years of experience.



Combination Chucks

Gisholt Boring Mill Chucks are of particularly heavy construction to meet severe demands. They are designed especially for the accurate and heavy-duty requirements of modern boring mill practice. These chucks embody our "Patented Dirt-Proof" feature.



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CANADIAN MACHINERY AND MANUFACTURING NEWS

Volume XXI. No. 18. May 1, 1919

The New Home of Williams & Wilson, Limited

Montreal Firm That is Now Established on Good Business Footing, Played a Big Part in the Equipping of Munition Plants in This Country

WE illustrate on our front page the new premises which are owned and occupied by Williams & Wilson Limited, 84 Inspector Street, Montreal. Without exaggeration we can safely say these offices and warerooms are unequalled for the purposes for which the building is designed. Before giving a description of the warerooms, the following short sketch of the company is, we think, not only interesting, but instructive, and should be encouraging to others who are ambitious and who have faith in the future of Canada.

Some twenty-eight years ago Mr. F. C. Wilson, then a very young man, started his career in a very modest way at 305 St. James Street, Montreal. From the first he had the happy faculty of attaching to himself men of ability and integrity. The unswerving loyalty of the staff is the keynote of the success that has attended the company from its inception. Each year added new friends and greater responsibilities. By the time the war broke out the company was doing a large business and had a very strong organization.

In connection with production of ammunition a crucial test was put upon the brains of the mechanical world. Canada was heavily handicapped, as we had no experience and no training of any kind with the exception of the Dominion Arsenal at Quebec. Notwithstanding this handicap our country developed a production of munitions which was of vital importance to the fighting forces on every front. To quote Mr. Winston Churchill, British Minister of Munitions: "Canada's remarkable output of munitions has played a large part in the munitioning of the British armies, and will remain a testimony to the high value in that great struggle of all those, whether manufacturers or workpeople, who shared in the work."

To be able to lay out the tools for the infinite variety of operations in the manufacture of all sizes of shells, fuses, etc., and to anticipate the market and secure delivery of the vast amount of equipment required, this was the task which fell to the engineering staffs who supplied the manufacturers with their machinery. Some of the largest and most successful plants were equipped almost entirely by Williams & Wilson, Limited. Their efforts are recognized as playing no small part in the happy results of which Mr. Churchill speaks in such glowing terms.

The continued expansion of the company's business necessitated larger and better premises. To this end four lots were purchased—two on Inspector Street and two on Montfort Street, making a block 45 ft. x 185 ft. from street to street. On this lot has been erected a four-storey reinforced concrete building as illustrated, with a basement having a 14 ft. headroom, the entire building having a floor space of 40,000 sq. ft. The office occupies the entire second floor. It is considered the handsomest business office in Montreal. A ten foot dado of maple, our Canadian national wood,, maple counters and facings, floor of Tennesse marble—these features have combined to make one of the most happy and artistic effects in modern office architecture.

The company carries a large stock of machinery and machinery supplies. It represents the leading Canadian and American manufacturers and an inspection of the basement, first, third and fourth floors will prove the claim that this company is in a position to supply from stock all lines that they could reasonably be expected to carry.

Thus, after a quarter of a century of sturdy effort Mr. Wilson finds himself the president of a Canadian company of the first rank, with a paid-up capital sufficient for all the exigiencies of business, and every share of which is owned by himself and his staff, and with handsome, well-appointed warerooms and offices, and a staff of engineers and salesmen of which he is justly proud. Of the personnel of this staff we speak in another column. Mr. Wilson says it is



EXECUTIVE PRIVATE OFFICES SHOWING M. B. BRONSTETTER, E. KINGSLAND AND W. C. RICHARDSON.

thanks to his staff, and not to him that the success of the company should be attributed. It is a tribute to Canada, and particularly to the metropolis, that such a reward for efforts, however well directed, should be obtainable in such a comparatively short time.

DESCRIPTION OF BUILDING

The new building has a frontage of 44 feet on Inspector Street, running through to Montfort Street in the rear, a distance of 188 feet, and comprises 4 storeys and basement. The structure consists of a reinforced concrete frame of beam and slab construction, with brick curtain walls. The Inspector St. facade is built up of Indiana limestone pilasters, bonded to the concrete frame and worked up in three bays. The centre bay is 25 feet wide to provide a large "show" window on the ground floor to allow an unobstructed view of the contents. Between pilasters the entire front is built up of architectural ironwork and glass to the ceiling of the top floor, over which limestone is arched to give the pleasing appearance shown in the illustration.

The ground floor is 4 feet above the level of Inspector Street, and the "show" window floor is supported on a concrete beam at the street level.

The main entrance door is of oak with an ornamental iron grille to protect the glass and brass kickplates. Two ornamental lighting fixtures are mounted on the outside walls at the entrance. The entrance porch is panelled with marble, the panels, capping and base of Venosa marble, and the styles of light vein, and the steps with Venosa marble treads and risers.

Cantilever Footings

One of the engineering difficulties to be overcome on this building was caused by the necessity of placing the column footings on sand, in which was a heavy flow of ground water, as the basement floor is several feet below sewer level. The wall footings also were not extended beyond the property line. To meet with these requirements the footings were designed as cantilevers, of heavy, reinforced concrete. The basement floor, which is made 12 inches thick, to prevent uplift, and walls are waterproofed with "Tockohth" put in the mix, to prevent the entrance of ground water.

The floor slabs are designed for heavy loading, as follows: ground floor, 300 lbs.; first floor, 100 lbs.; upper two floors, 250 lbs.

Shipping Facilities

Excellent shipping facilities have been arranged on Montfort Street, where the ground floor frontage is entirely taken up by two large shipping doors, which, besides the ordinary wood doors, are equipped with steel roller fire curtains. From Montfort Street the trucking floor runs 35 feet into the building at street level, then 3 feet above is the shipping floor proper, which allows the goods to be trucked direct on to motor trucks, which are backed into the building so as not to obstruct the traffic on Montfort Street. A complete equipment of Bowser gasoline and oil pumps is installed in the shipping room.



VIEW OF THE GENERAL OFFICES ON FIRST FLOOR.



VIEW OF THE GENERAL OFFICES, SECOND FLOOR.

Office

The entire second storey is used as an office. The floor is laid in marble squares, in which are inserted flush boxes for individual telephone service at each desk, doing away with unsightly telephone wires. The walls are panelled in selected white maple. The lighting for this floor is accomplished by specially designed lighting fixtures. The third floor is laid in cement, with a special hardened cement finish, treated with two coats of cement dressing. The top floor is equipped as a machine and woodworking shop. The shafting hangers are carried on inserts set in the concrete beams.

The Montfort Street elevation is laid up in red brick, with exposed concrete beams and lintels. All windows have steel sash, wire glazed. The ordinary type of iron fire escape, with scuttle ladders, is mounted on this elevation. The interior stairs from floor to floor are of steel, with slate treads, and all are enclosed in fireproof steel and wire glass enclosures. Each floor is equipped with lavatories of the latest type. Two Leonard boilers provide the necessary heating which is of the Webster vacuum system. On account of the length of this building

it was necessary to provide a light well, 53 feet long, on the north side, to let daylight into the centre of the building.

A 5-ton, direct-connected elevator, with 8x12 foot platform, is installed to handle heavy machinery, and is equipped, at each floor with "Peelle" interlocking fire-doors. Provision is made for the installation of a light elevator.

The building was designed and erected under the supervision of T. Pringle & Son, Ltd., engineers and architects, of Montreal and Toronto.

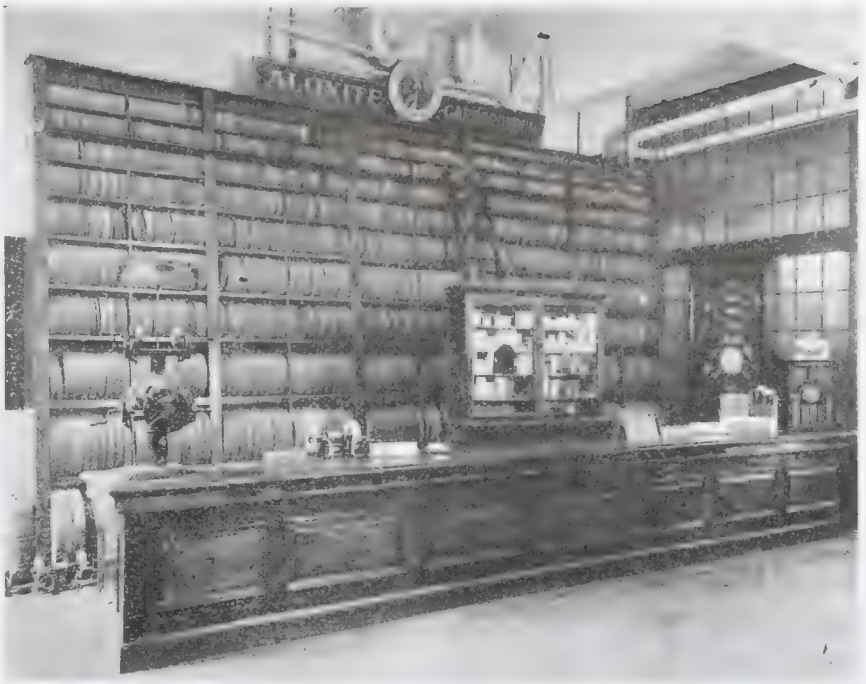
M. B. Bronstetter

Michael Benjamin Bronstetter was born and educated at Morrisburg, Ont., and while still a youth he joined the firm of Williams & Wilson (before it was incorporated) and with this company he has been ever since. For over twenty years, and Mr. Bronstetter is still under forty, he has been with the company. He started at the lowest rung, and by conscientious, hard and brainy work, he has now reached the position of sales manager.

The trouble about "Mike" is that while he makes friends right and left he never loses any. He was never known to go back on his word or "crawl" on a bargain. Much of the success of the company's organization is due to his cool judgment, backed by his bed-rock principle. Such men can never fail. The word "failure" is not conceivable in characters who have built up their own positions by industry, ability and God-fearing lives.

Walter C. Richardson

Walter C. Richardson was born at Brantford, Ont., in 1886. When one hears of Brantford one naturally thinks of the Waterous Engine Works. It was in this plant that the first five years of Mr. Richardson's training was spent, as an apprentice mill-wright, and when he had completed his four years training as mill-wright was promoted to the engineering department, and after this a course at a business college fitted him for his start, and he joined Williams & Wilson, Ltd., twelve years ago.



CARBORUNDUM DEPT. ON GROUND FLOOR.

During this twelve years, Mr. Richardson has developed a contracting, conveying department which has been constantly growing. One branch of this department is locomotive coal handling machinery, and Mr. Richardson has taken the contracts and built and installed some of the plants on Canadian railways. These mechanical coaling plants can be seen at most of the divisional points of the Canadian Pacific Railway, also on the Transcontinental Railway from Winnipeg to Moncton.

Last week there was exhibited in one of the "movies" in Montreal a reel showing the harbor of Halifax, and the Olympic coming to in to be coaled. Then appeared the coaling towers, and the monster alongside being fed at the rate of 200 tons per hour. The reel went on to say that the Olympic saved three days on this trip by using this new bunkering and coaling plant. One naturally stops to think what the Olympic's overhead for three days would be, and if the Olympic can save three days a trip, and other ships pro rata, how long will it take to save a quarter of a million dollars and write off the plant?

The Imperial Government placed the order for these coaling towers with Williams & Wilson, Ltd., last July, and Mr. Richardson is to be congratulated on the complete success of the plant.

One of the most valuable assets in any business man is versatility. At the starting of the war, there was more or less of a lull in the conveying and elevating lines, and when the great rush came along for machine tools, Mr. Richard-



MR. B. BRONSTETTER.



W. C. RICHARDSON.



MR. KINGSLAND.

son did not take long to adapt himself to this line, and it was not any time before he was very much in the machine tool line, and from the start of the rush to the end he was very active in equipping munition plants. Some of the largest shell and fuse plants were practically entirely equipped by him.

Ernest Kingsland

Ernest Kingsland was born in Ottawa 37 years ago. For the past thirteen years he has been connected with Williams & Wilson, Ltd., and has for some time been a director in the company.

After leaving high school Mr. Kingsland entered the Canada Atlantic Car and later started apprenticeship in the Canada Atlantic Locomotive shops where he served for five years. From these shops he graduated to the Canadian Pacific Railway shops at West Toronto, where he remained for about a year.

With this training Mr. Kingsland came to the front very rapidly when he started his career as a salesman of machine tools. From the start his ability was appreciated, but it takes more than education and more than technical training of a high order to establish confidence in the minds of those responsible for the mechanical equipment of railroads and industrials.

Without making any assertions as to Mr. Kingsland's ability in mechanics, or his salesmanship, it is only necessary to follow the history of the operations of the Imperial Munitions Board to find that the man the mechanical organizations within hail turned to was "our spoke." Without exaggeration it can be said, and in justice should be said, that no other man assisted so much in the rapid and successful manufacture of munitions in Canada. The writer of this article wishes to make no invidious comparisons, but a reference to the experts employed by the Imperial Munitions Board will justify the above statement.



MACHINERY SUPPLY DEPT. ON THE GROUND FLOOR.

The man who could rise to this occasion, and such an occasion! is the most valuable asset a company can have and one of the most useful citizens of any country.

THE WORLD'S FASTEST SUBMARINE

The fastest submarine vessels in the world were designed and constructed for the British Navy during the war. They were evolved in response to the demand for submersible craft which could keep station with the fleet when cruising, and also undertake long voyages without the aid of mother craft. Many new features were embodied in this class, which has proved itself a conspicuous triumph of British engineering. Unlike other submarines they are fitted with steam turbines, which are used during operations at a high speed on the surface. Secondary propelling power is obtained from a heavy oil engine of 800 brake horse power, which drives a dynamo supplying electricity either to electric motors geared to the propeller shafts (for surface cruising at moderate speeds) or to electric batteries which store energy for propulsion under water. When submerged these vessels have a displacement of 2,1570 tons. They are nearly 340 feet long and have a double hull except at the ends. An exceptionally powerful wireless telegraph intallation is fitted for long-distance work. The aerials are carried on long, telescopic masts operated by a telemotor system. Electricity is also used for driving the air compressors and bilge pumps, while the steering gear and the hydroplane driving gears are controlled by a special hydro-electric system.



SHIPPING DEPT. ON MONTFORT STREET.

CUTTING STEEL UNDER WATER

An oxy-acetylene blowpipe of special construction has been used for some time past by a French firm for cutting steel under water, a feat hitherto considered practically impossible. The apparatus consists of a cutting blowpipe supplemented with a small diving bell to which compressed air is admitted to expel the water. The pressures of oxygen and acetylene required are much higher than those usually employed, and, naturally this pressure will depend upon the depth at which the apparatus is worked. At the trials now being carried out, ships' plates have been cut at a depth of 27 feet under water. It has been proved that arc cutting can be carried out in a similar way, but the apparatus is slightly more elaborate.

Some Jigs and Fixtures of General Interest

In This Article Are Shown Three Fixtures, Used in the Manufacture of a Well-known Line of Millers—Although Not Elaborate, They Accomplish Their Object Admirably

By J. H. MOORE, Associate Editor CANADIAN MACHINERY

IT is absolutely necessary in the manufacture of any machine tool that parts be interchangeable; therefore, to ensure this point the various parts must be jigged. This is especially true in the manufacture of such an accurate machine tool as a milling machine, and the following three jigs, as shown on photos accompanying this article, are used for such class of work.

Lathe Fixture

At Fig. 1 is illustrated a jig used on the lathe, and for the purpose of finishing and facing the saddle of the miller. A is simply a gib which goes with this fixture. To further show the design of this jig, the sketch, Fig. 2, was made, and in this sketch is shown the two views, the side view being partly in section to show up the various details.

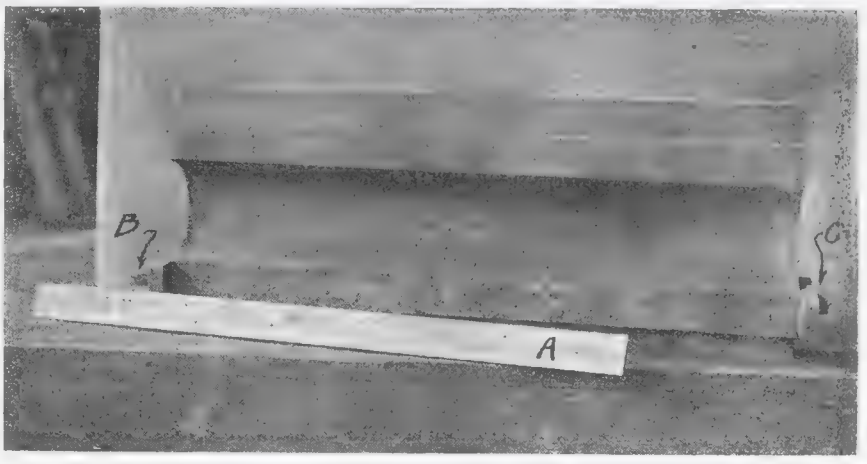


FIG. 1.—LATHE FIXTURE FOR FACING SAD DLE.

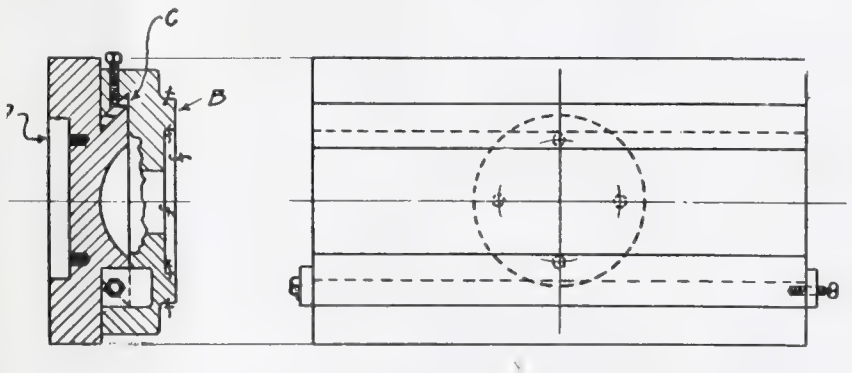


Fig 2.

FIG. 2. SKETCH OF LATHE FIXTURE FOR SADDLE.

First, the saddle B is placed in position as shown. The gib C is also inserted as illustrated. The regular set-screws on saddle tighten against this gib, and holds the work securely in place. Referring to Fig. 1, two stops will be noticed, B and C, the latter a solid stop; the former adjustable. These are also used for locating purposes.

As will be noticed on sketch, Fig. 2, the back portion of jig is recessed at D to suit the size of face plate on lathe, being also drilled to accommodate four cap screws for fastening purposes. The fixture by this method always centres itself, while by means of the adjusting screws already spoken of the work is centred to its proper position.

Drilling Fixture

At Fig. 3 is shown a very simple, yet efficient jig, used to drill the elevating screw hole in the knee. The method of placing this jig in position is rather interesting, so a description is given to aid the reader in following its use. The space A is slipped over the support boss in knee and the faced side of boss is butted up against the adjustable stop B. The set-screw C is then tightened. Through holes D, E and F go guide pins, which in turn come through holes already drilled in the knee. These pins coming from various directions in this way, guarantee that the fixture is in correct location, relative to the holes already drilled. Altogether, although a simple fixture, it accomplishes its purpose quickly and easily.

Taper Turning Attachment

The last of the three fixtures, illustrated at Fig. 4, is used to turn the taper portion on the main spindle of miller. The fixture differs from the

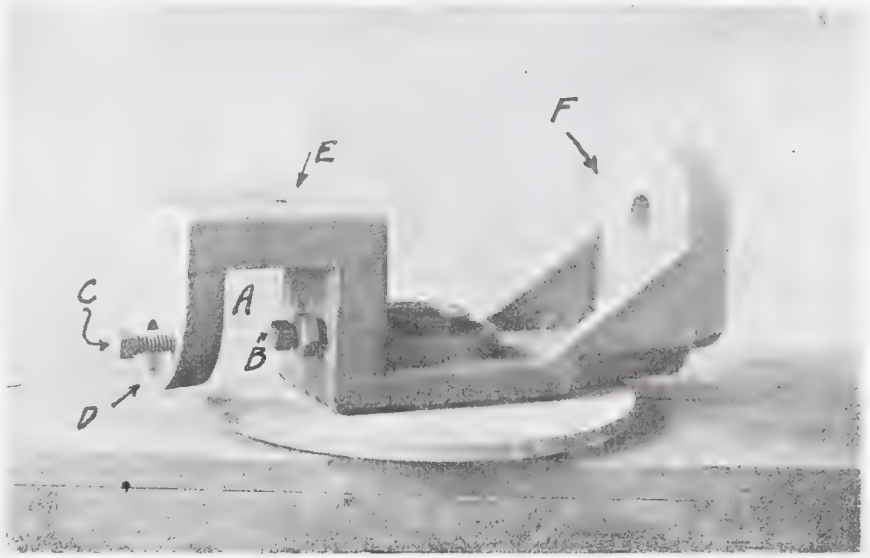


FIG. 3.—DRILLING FIXTURE USED ON KNEE.



FIG. 4.—TAPER TURNING ATTACHMENT

usual lathe type of taper turning attachment in some respects, and a detailed description is given herewith, in order that readers can follow exactly how it is used. The piece A bolts directly to the cross slide by means of the two cap screws shown on this view, while the piece B in turn sits on top of the piece A, a bolt with T head going into the slot on piece A, and coming through the slotted hole on piece B.

Pieces C and D sit on top of ways of lathe bed, and fasten underneath by means of the two clamps E and F. The bar G is, of course, the guide to the taper desired, and readers can readily see that the two blocks H and I are adjustable, so that they can be set to any angle desired. Such a fixture as this is worthy of installation, its rigidity and capability for accurate work being its chief assets.

In fact, all the three fixtures as shown in this article can be used for other classes of work equally as well, simply by making slight changes in the general design to suit particular conditions.

UNLOADING GRAIN BY AIR POWER

The two powerful floating pneumatic grain elevators recently put into service at the Port of London are admirable examples of modern British labor saving equipment. Each elevator floats on a 60-foot pontoon, carrying a 220 h. p. oil engine, which drives a high-speed turbo-exhauster by means of which a partial vacuum is caused in a suction pipe line. The air rushing in at the free end of the line sucks up the grain from the vessel's hold and deposits it in a receiving chamber, from which it is discharged through a valve, and thereafter handled mechanically. Two suction pipes are provided with each float and they are raised and lowered by means of an electric winch driven by an explosion proof electric motor. A similar type of motor (rendered necessary by the inflammable type of dust raised in handling grain) drives an elevator which delivers the grain into a weigh-house, where the grain is automatically weighed. Thence it passes through chutes into sacks or into hopper barges alongside the pontoon. A 35 h. p. oil engine supplies the current for power and lighting purposes. All the plant and equipment is British throughout. Pneumatic elevators of this type not only saves labor by thoroughly cleaning out a ship's hold without re-trimming, but they are much healthier for the workmen than any other equipment, as special machinery is used to extract the dust. Both pontoons have been in regular service for some time and have proved thoroughly satisfactory. Each has a capacity of 100 tons per hour when working with wheat.

The rapid development of electric welding in Great Britain, fostered by the Admiralty for ship construction and other purposes, has led to some highly important improvements in this useful means of forming a close union between plates and other sections of iron or steel. The British experts who carried out successful work of a novel kind have made excellent use of "flux-covered" metal electrodes. In this system the metal electrodes, between which ahe arc for melting purposes is struck, are covered with certain materials which flow under th eheat of the arc and protect the metal from oxidation during the process. In welding steels alloyed with special substances, a flux can be used containing the alloys, thus supplying them to the weld as it is being made. By this means the weld is made uniform in composition with the remainder of the metal. Special attention is also being given by British engineers to the testing of welds by "radiometallography." The weld is examined under the X-rays much as aportion of the human body might be, and internal imperfections are thereby revealed although they may be covered by a solid, close-grained surface. Many British men of science are devoting themselves to research in this direction, which is calculated to be of great practical value to all users of metals. It may be recalled that Great Britain led the way in the microscopic study of the structure of metals—a study which laid the foundations of modern scientific metallurgy.

THE way in which response is being made to the invitation for apprentices in drafting rooms to send in their work on CANADIAN MACHINERY drawing lessons is one of the most gratifying things that has happened for some time. Apprentices realize that it is the real thing, and journeymen draftsmen know it is what the learners need, and are recommending them to follow the course right through.

The apprentice should see to it that he has his own copy of CANADIAN MACHINERY—he should subscribe and file away all the references he sees to drafting and drawing. It is the cheapest form of education he has a chance to get.

Here is what a draftsman thinks of the course. The letter was unsolicited and speaks for itself:—

277 Mary St., Hamilton, April 6, 1919.

Canadian Machinery,
Toronto, Canada.

Gentlemen:—The writer has just finished reading the first instalment of your new Mechanical Drawing Course.

Being a draftsman himself eliminates him from the contest, but not from a perusal of your articles. If all the future issues measure up to the original style of this first one, the course will do a lot of good as it fills, in the writer's opinion, a long-felt want.

The usual conventional style is missing, but in its place is practical talk, touching on the parts that really count and giving beginners a clear idea of how to use tools in the proper way.

Your prize idea is a new one on the writer, and should prove a winner as it adds an incentive to neat work—which is sadly needed with beginners —and a greater interest to the contestants.

You probably had only the machinist apprentice in mind when you started this course, but the draftsman apprentice will also benefit from following these articles.

Wishing you every success with the course, and also in your entire paper, believe me,

Sincerely yours,
A. R. ANDERSON.

Mr. Shell Runs into Red Tape Brigade

The Story of an Amusing Encounter a Toronto Manufacturer Had With Ottawa's Officials During the First Days of the Great War —A Contract That Wasn't

By WILL E. MACDONALD

BECAUSE my friend Mr. Shell thinks it best at this late date that no trouble be stirred up for certain misguided individuals who stood too much on ceremony and blocked the way for action in the first days of shell production in Canada, it is necessary to omit the proper names of the characters in one of this country's most amusing war-time farces. Probably the main injury was suffered by Mr. Shell himself and therefore he has the greatest right to bury the identity of the characters under fictitious titles.

Be it known that Mr. Shell is a competent business man as well as a clever mechanic, who controls one of the largest machine businesses in Canada. But though working night and day to assist in the turning out of munitions he still found time for a little humor. When it is realized that the humor was obtained at the expense of Ottawa's shell committee, most munition manufacturers will take off their hats to Mr. Shell.

The General Writes

When war broke out Mr. Shell was one of the first to wire and write Ottawa that he was prepared to make munitions. An answer came promptly from General Knowledge that the Government had munitions on hand and that it did not look as if any would be manufactured in Canada outside of the Dominion Arsenal, but Mr. Shell's letter would be kept on the writer's desk. Yes, indeed! Mr. Shell waited a few days and then decided he'd better mind his own business.

Perhaps three months had passed when Mr. Shell received another letter saying that his name was still before General Knowledge but that no action had been taken. A Shell Committee had been formed and the letter would be sent to them.

Mr. Shell then got wind of the awarding of contracts for shells and he started a little private scouting work. About this time a financial institution asked Mr. Shell to inspect a plant in the city and report on how much money would be required to put it on a munition-making basis. Mr. Shell made the inspection, and a written report to the institution and promptly forgot about it.

The Missing Contract

A short time later Mr. Shell ran across Col. Bluffgood, home from Ottawa and the Shell Committee for the week end.

"How's the contract getting along?" asked Col. Bluffgood.

"What contract?" enquired Mr. Shell.

"Why your contract for munitions which the committee awarded you," was the reply.

"You're off your nut," laconically replied Mr. Shell. "I haven't any contract."

Col. Bluffgood took on fresh dignity.

"You certainly have a contract, and here is the number of it and the quantity of shells you're to turn out," said he, reading the information from a notebook. "You had better get in touch over the phone with General Orders."

Mr. Shell dashed madly to a phone and got General Orders on the phone.

"Nope, nuthin' doin'," is about the vernacular of General Orders' reply to Mr. Shell's enquiries.

Mr. Shell went back to his desk and his business with various thoughts about shells and the so-called "big guns" at Ottawa. He then called Col. Bluffgood on the phone.

"That is very funny because I was there when your contract was awarded," was Col. Bluffgood's reply.

Ottawa on the Wire

Mr. Shell wired and wrote. He phoned. He worried, but to no avail. And while all this was going on official Ottawa was preparing, via its busy typewriter, fresh horrors for him. Right in the midst of all this came one of those terribly official-looking documents which are sometimes dictated by fussy private secretaries and signed by empty-headed chiefs. It said:

"Your shell order No. ——.

"You have not sent in any of your tensile strength reports. Your contract clearly states that you are to make these tensile strength reports before turning out shells," and so on. That was not just the exact wording, but the general idea of the letter is conveyed.

The humor of the thing dawned on Mr. Shell. He was busy night and day making lathes and other shell machinery for the lucky manufacturers who secured contracts, and he thought that he might as well have a little fun as well as Ottawa, so he paid no attention to the letter. A few days passed, and along came another of the dangerous-looking missives. This was sterner in tone and demanded immediate reports on tensile strengths. Mr. Shell forgot to answer that also.

Shell Men Call

On the heels of this letter two representatives of the Shell Committee appeared at Mr. Shell's plant.

"How are you getting along on your contract, Mr. Shell?" they asked.

"Oh, so-so," answered Mr. Shell.

The two representatives looked very serious. Their faces indicated grave displeasure.

"Well, we'll look over your plant," they decided.

Mr. Shell took them out, and they at once noticed that no shell-making machines were installed.

"Why, man, you're not half ready!" they exclaimed. Mr. Shell puffed his cigar and said nothing.

"Where are your lathes?" they asked.

"I'm making two lathes a week," said Mr. Shell, but he didn't volunteer the information that the lathes were being rushed to munitions plants.

"Well, if you are making two lathes a week, where are they?"

"I'm making them, that's all you need to know," said Mr. Shell.

Enter Mr. Softjob

"How long will it be before you have the lathes up to begin your contract?" they asked.

"Can't say," grunted Mr. Shell.

"Will you be ready in a month?"

"That all depends."

Both representatives seemed fairly well disgusted as they wended their way out of the plant.

"We'll report this to the committee," they said.

"Sure thing," Mr. Shell called out.

Then another letter from Ottawa. This to the effect that Mr. Softjob would be around to see how much steel Mr. Shell required on his contract.

Mr. Softjob breezed in.

"Came to see how much steel you need," he began.

"Can't say yet," was Mr. Shell's retort.

"Well, I'll look over your plant and tell you myself," Mr. Softjob answered.

Mr. Shell and he went out to the plant.

Mr. Softjob was horrified.

"Why, you'll not be ready for a long time. Where are your lathes?"

"Making two a week," said Shell.

"Well, you won't need steel for a long time," opined Softjob. "I'll advise Ottawa," he remarked.

"Sure thing," agreed Shell.

What Brass Hat Said

By this time Ottawa's typewriter was busy again, backed up by the telegraph wires. The officials had evidently tired of the fun to be derived from breaking the letter carrier's back so they took to trying to break down the telegraph lines.

"Must have your reports immediately on tensile strengths. Wire when you are sending these reports. Most important."

This was about the substance of the wires received by Mr. Shell.

Shell did not answer the wires. He was thoroughly into the joke.

Col. Brass Hat arrived at the plant a short time later. He strutted into Shell's office and found the latter studying blue prints.

"You are Mr. Shell," he accused, striking his cane against the floor.

Mr. Shell entered a plea of guilty.

"I am Col. Brass Hat of the Shell Committee," was the next piece of startling information handed out.

But even then Mr. Shell forgot to bow.

"You have a shell contract, sir. Have you sent in any tensile strength reports?" demanded Col. Brass Hat.

"No," meekly replied Mr. Shell.

"Then why haven't you?" This in a thundering tone.

"Can't be bothered. Have a cigar," invited Mr. Shell.

"Cigar de d——d," stormed the Col. "Couldn't be bothered, eh? Well, let me tell you that for letting shells leave your factory without tensile strength being approved you can be court-martialed and shot, and by gad I'll make it warm for you. What kind of a man are you to send poor ammunition to our boys, and perhaps have it explode among them and kill them. What do you mean, sir! The idea of making shells and not taking tensile strengths. A man like you shouldn't have a contract. You're worse than the Germans. And . ."

Mr. Shell Speaks Out

But that is as far as he got. Mr. Shell found his voice.

"You happen to be in my office, and I don't allow people to talk to me like that in my office," said he. "I offered you a cigar a moment ago and you refused it, and now you can choke for one. But this thing has gone far enough. I haven't a contract; never had a contract, and what's more, I don't want a contract. You bunch of practical jokers at Ottawa have had a nice time with me and I have been so busy rushing out machines to manufacture munitions that I could stand a little humor, but you can go back to your Shell Committee and tell them that Shell never had a contract, and wouldn't take one now no matter what price they offered. And you can get out of my office as soon as you like."

Col. Brass Hat was flabbergasted but managed to stumble out a few apologies as well as to accept a cigar. He then left.

"I'll report to Ottawa," said he.

"Sure thing," agreed Mr. Shell.

The Shell Game

And that is the story of how Mr. Shell was shelled by the Shell Committee over a shell contract that he didn't get. And for arm-chair sleuths who may wonder as to where the contract went, let it be pointed out that elsewhere mention is made of a report Mr. Shell made on another plant for a financial institution. That is where Mr. Shell's contract went, but how and why can only be understood by those who appreciate the significance of the old expression, "a shell game."

Pointers on the Designing of Wire Rod Mills

The Principles of Rolling Mill Practice — Special Problems Encountered in Rolling Small Sections—Physical Characteristics of Rolled Shapes — The Proportioning of Rolls For Wire Rod

By W. S. STANDIFORD

LARGE quantities of barbed wire were used by the belligerent in the great war as it was found out by experience, that when wire entanglements were used in front of the trenches, that fewer men were needed to hold the trench against enemy attacks. As the basis for wire is wire rods, the designs of the roll passes and the difficulties encountered in the manufacture of the rods will, undoubtedly, be interesting to the readers of this magazine.

Most mill managers and others who are not in any degree familiar with the principles upon which roll passes are constructed, or who have no theoretical or practical knowledge of roll designing, seem to have an idea that all that is necessary in the designing of rolls, is to turn a series of passes in the rolls having the form of the finished bar. A trial of such passes for producing the common round or square would demonstrate some of the elementary principles of roll design, namely: That rolls can only reduce metal in a line angular to their axes; that the general direction of one or both of the surfaces of the rolls between which the reduction takes place must be angular to the plane of rotation; and that passes do not lessen the dimensions of the bar which is parallel to the axes of the rolls, but in all cases, increase it more or less. For the latter reason, when the section is wider than the groove, the metal extending between its sides is not pressed into the body of the section, but is pinched out between the collars forming the sides of the pass and makes a thin rib along the sides of the bar, which is technically called " a fin." All mechanical design is a compromise in parts to secure the best general result as a whole. So it is in roll designing. Passes are modified in their form and details in view of their relation to each other and to the layout of their train of rolls, its capabilities and the character of the work they are required to do. The ordinary diamond passes, while excellent for some classes of work, have been found out by experience to be far too slow for use in rolling wire rods, as they allowed the rods to cool very quickly. With the demand for small sized rods, a quicker and more effective form of pass became a necessity, the result being the adoption of a series of alternate oval and square passes, which proved to be very efficient and also more rapid as they have a draft equal to two or three times that of the diamond pass. There are few forms of grooves in which the section reduces evenly, that is to say, where the draft is proportioned to the thickness of the section in all of its parts. The length of a bar increases as the area of its cross section decreases, and as the increase in length must be co-extensive in all parts of the section, it follows that if one part is subjected to a heavier draft than another, the metal must flow into that part having the least, and any form of pass which favors the flow of metal, works the easiest.

Iron or steel may be wrought to a degree of malleability greater or less. This property as commonly applied to iron indicates that it may be worked; that is to say, it may be heated to a degree of plasticity and reformed and drawn out without a fracture. The mechanical means used for these purposes, with which we are familiar, are the hammer, the press and the rolls. We are also familiar with the difference in the structure of a hammered and a rolled bar as shown in a fracture, the latter being finer and more uniform in texture, because the roll pressure is applied over all, or nearly all of the entire section directly or indirectly, and throughout the entire length of the bar, and at a practically even temperature. We know that under the law of inertia, one particle in a mass may be moved so quickly by the impact of a rapidly moving body, that it has not time to impart

its motion to its neighbor. This is, to a certain extent, the effect of the impact of a hammer upon a body of metal. We may assume therefore, that the rolls, from a mechanical standpoint are more conducive to a uniform structure and higher degree of elasticity than the hammer, from the fact that the pressure

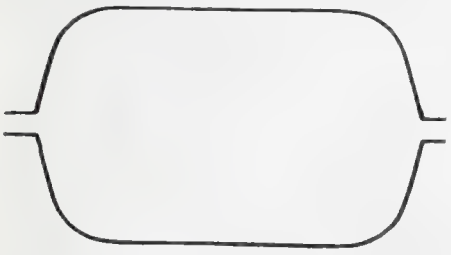


FIG. 1—SHOWS SHAPE OF BOX PASSES USED IN ROUGHING ROLLS IN WIRE ROD WORK.

is applied deliberately, thereby giving the particles of metal time to readjust themselves to the new form; in short, to induce a flow. In this lies one of the points of superiority of the press over the hammer.

Iron and steel heated to a sufficiently high temperature, will become liquid, and flow by gravity, but as the temperature lowers, it can only be induced to flow by pressure, as in the press and the rolls, and as the temperature lowers the flow diminishes and finally ceases as the metal sets, after which further working tends to disintegrate the mass. Cold working, such as cold rolling and wire drawing, are everyday practices, but they can only be done to a limited extent, depending almost entirely upon the grade of the material; but unless it is frequently annealed, which gives the particles of the metal an opportunity to adjust themselves to relieve internal strains, the metal becomes crystallized and its ductility impaired. Generally, steel can be worked at a lower temperature than iron. The latter is required to have a welding heat to properly unite the mass, yet, while the heat may be right, it is always, except under extraordinary care with the best materials, more or less imperfectly done owing to the presence of foreign matter which has not been worked out and other causes. Such material, when rolled at too low a temperature, works irregularly in the rolls, especially in the smaller sizes, while steel, having a more homogenous structure, maintains its regularity but becomes abnormally hard and close grained. For the latter reason, some consumers require that the higher grades of steel shall be rolled at as low a heat as possible. The form of the pass, the more or less perfect physical structure of the metal, and the degree of heat are the important factors in determining the draft in passes for wire rods and small sections. We can deduce from the above principles, that with a high temperature, a radical change in section, as from a square to an oval, may be attended with considerable reduction in sectional area; while low temperatures render such a change in section impossible, and as the temperature lowers, the sectional change and drafts must be modified.

From the above facts, it is essential in designing passes for this kind of work, not only to decrease drafts, but to make the ovals thinner and wider as they decrease in size. In designing rolls, it is the custom of roll turners to make the rolls of such a diameter as to allow sufficient strength to prevent breakage, but the diameters are usually out of all proportion to that necessary for strength, particularly in the case of the smaller passes for wire rods. It is difficult to state in a general rule just what amounts of draft could be put in a square or oval, but it can be ascertained by taking the mean of a series of passes and formulating a rule therefore, and apportioning the drafts in the others according to the conditions of the train of rolls which differ more or less in every mill. Taking the average grade of low carbon steel, maximum draft on a 3-inch square billet is about 75 per cent.; while on the smallest square in the series (in the finishing oval) not more than 15 per cent. is allowable. The wide difference in the grades of metal rolled makes an arbitrary rule of roll drafting impracticable, if not impossible. These conditions vary in themselves. Some trains are constructed in which the diameters and lengths of the

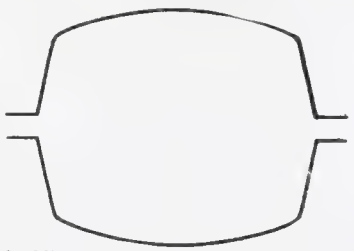


FIG. 2—SHOWS SHAPE OF EDGING PASSES USED IN WIRE ROD ROUGHING ROLLS.

rolls are adapted to the passes that are to go in them and have ample strength and they are capable of resisting stresses of the heaviest drafts that can be put upon them. In some other roll trains, the passes and drafts have to be modified, it all depending on the engine power, thickness of rolls, and the quality of metal rolled. Thus a low carbon steel can be reduced 15 to 20 per cent. faster than the softer grades of iron. On the other hand, tool steel which can only be heated moderately, cannot be subjected to a heavy draft, because a heavy reduction in section when the metal begins to set and the flow ceases, will injure the metal and most likely break the rolls.

The standard size of billets as used in the average wire rod mill is 4 x 4 inches square, their weight ranging from 100 to 200 lbs. Eighteen passes are generally used to reduce the 4 x 4 inch billet down to a number 6-rod (Birmingham wire gauge), which is .209 thousandths of an inch. The longest series of alternate square and oval passes are those used in wire rod manufacture. As from three to eight rods are rolled at one time, using alternate square and oval passes, it is necessary to have a number of duplicate grooves in the rolls, so that when one wears out, another pass can be used. An oval pass could be used for the first pass, but the rolls would be unnecessarily large in diameter for those preceding it. By using eighteen passes to reduce the 4 x 4 billet, the draft in the first two passes may be modified, so that smaller rolls can be used. Those rolls as a rule are 18-inch pitch diameter. As the modified draft in the first two passes is not enough to use an oval to advantage, a change in the form of these passes is necessary. The form adopted in most mills for the first two grooves, are the box and edging passes. As the billet comes from the furnace, it is at its highest temperature and will allow of considerable reduction in the box pass shown in Fig. 1. Box passes reduce the billet mostly on the top and bottom, there being very little work done on the sides. In order to allow the billet to go through the groove easily, it is necessary in designing these passes to make the sides tapering allowing the billet to fit snugly at the bottom. If the sides of the groove were made straight, the billet would be torn at the joints of the rolls, and spread out between the collars, would break the rolls. The tight fit of the billet at the bottom, prevents it from turning over in the pass and jamming the rolls. The use of large fillets in the bottoms of both box and edging passes ensures that the corners of the billet are worked equally which makes the metal fibrous in character, the latter condition making iron and steel have their maximum strength. As the billet has had only two of its sides reduced in the box pass, it is turned over at a right angle to its previous position in the box pass, and inserted edgewise in the edging pass shown in Fig. 2, which squares the billet up, making it 2¾ inches in size and ready for the alternate oval and square passes. The oval used for roughing passes is constructed geometrically by the intersection of two circles of equal diameter depicted in Fig. 3. Lines drawn from the points of intersection of the circles to the centres, are the angles of the oval. The length of the lines subtending the points of the intersection —the chord of the arcs—is called the

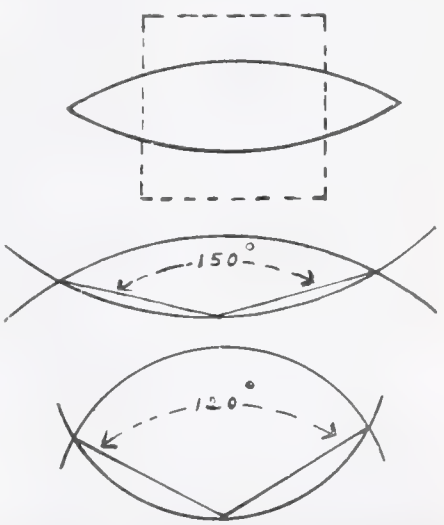


FIG. 3—DEPICTS COMPARISON OF SHALLOW AND DEEP OVALS ILLUSTRATING THE METHODS OF DRAWING THE ANGLES TO PRODUCE HEAVY AND LIGHT DRAFT PASSES.

width; and the sum of the two radii, less the distance between the centres of the intersecting circles, is the thickness.

It is plain that as the centres of the angles approach each other, the oval becomes relatively thinner, and that the angles and the number of degrees in the arcs increase. Fig. 3 illustrates ovals having different angles of 120 and 150 degrees of arcs. An oval is used between two squares, and by its proportionate width to thickness, it is made capable of light or heavy draft and a greater or less allowance for spread in both the oval itself and the square. The draft in an oval varies inversely as the number of degrees contained in the arc. In even figures, an oval having an area between 1 and 1½ square inches, and having an angle of 150 degrees, will reduce a low carbon steel billet 80 per cent. And an oval having an angle of 120 degrees will reduce a billet 50 per cent. The percentage of drafts in oval and square passes used in rolling wire rods must be decreased, as the rod cools through the successive passes and is reduced in size. The relative width and thickness of an oval not only affects its own draft, but the draft in the square following in like proportion, for the reason that the thin oval allows itself greater spread in the

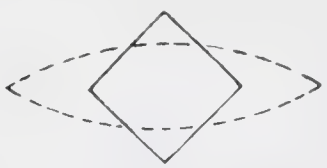


FIG. 4 ILLUSTRATES THE METHOD THE ROLLER USES IN PUTTING THE SQUARE BAR IN THE OVAL PASS. THE VIOLENT CHANGE IN SECTION, FROM A SQUARE TO AN OVAL BAR RESULTS IN THE METAL HAVIN GA MORE FIBROUS NATURE.

square and it will therefore stand considerable reductions in sectional area before the square is filled out. As the drafts in the first two passes in the roughing rolls are modified for the reason given in this article, and as the last two passes in the series are not depended upon for reduction, but merely to round up the rod from the last square, which is usually the same size as the diameter of the round, leaves 14 passes, seven ovals and seven squares, in which the draft must be distributed to reduce the billet delivered from the first two passes to a square equal in size to that of the finished round.

A series of passes showing the drafts used is appended in the table with this article. In passes designed for wire rod mills, the drafts in the smaller passes are made very light, principally to avoid making large loops between the passes, also partly on account of the large diameters of the rolls in the finishing trains, which causes the rod to spread more. The general practice is to use rolls from 10 to 12¼ inches in diameter for the last eight passes to gain speed in the delivery and strength in rolls long enough to contain a sufficient number of grooves to run a considerable time without changing rolls. These diameters of rolls are out of proportion to the size of the rod, which causes the latter to draw less and spread more than if the rolls were smaller in diameter, which have less, and a sharper contact with the rod. The great disparity in draft between the largest and smallest oval illustrates this point. The diameters of each set of rolls also require to be so proportioned, so that one set of rolls will not draw the metal faster than another set, as in this case, the rod would be stretched (it being reduced in two sets of rolls simultaneously). When a rod is stretched, its sectional area is reduced correspondingly, which would be advantageous if it were uniform throughout its length, but as the stretching takes place in the middle of the rod, it causes a variation in its size when finished; the middle portion being smaller than the ends. If the square is stretched, the rod will be more or less scant in size when finished in that part of the length. If the oval is stretched, it will be scant, and if to an unusual extent, it will not fill out the square pass it is entering, the result being that it will turn over in the pass and should the rolls happen to be running close together, a fin will be formed that will mark and spoil the rod. The same thing would be apparent in a wire rod train of the continuous type, except where the pull on the rod would be within its elastic limit. In this case, the rolls would grind away the metal and cause undue wear on the rolls and loss of power.

In the process of rolling the rod, one and the same end of it usually after the first six passes (in some of the newest trains through the whole series) is entered in the rolls first all the time, so that in relation to itself, the rod runs in one direction all the time, which gets the first end through the last pass with scarcely any perceptible loss in temperature while the last end loses rapidly through radiation and in contact with the floor plates. It takes about one minute to run a No. 6 rod weighing 150 pounds through the finishing rolls of a mill running fast enough to deliver a rod at the rate of 1,400 feet per minute, which makes a considerable difference in the temperature between the first and last ends. As has been explained, a difference in temperature causes the rod to work differently in the passes, the visible effect being greater spread. This peculiarity is not so noticeable in the oval passes as it is in the squares, for the reason that when a square pass is not filled out, it makes the diameters of the rod through the corners long and short, which causes the square to turn over in the oval. This also shows the reason why an oval will overfill from opposite causes, namely, the square being too large or too lean. Rods are said to be "lean" when they have not filled out the area of the groove. The leaner the rod, the greater tendency it will have to lie over in the oval, and when the square is very lean as occurs not infrequently, it turns over completely in the oval, and although there may be no more draft than is sufficient to drag the bar through, yet it will spread out of the pass, which is precisely the same result as though the square was too large instead of not being large or full enough.

It is for these reasons that the draft in the last passes is necessarily very light. Allowances in the turning of the passes should also be made for the space or opening between the collars of the rolls, as it is not advisable to run the rolls with their collars in contact with one another as it will cause pieces of metal to break out on the edges of the grooves and ruin them. The amount of space varies from ¼ of an inch in the roughing rolls, down to 1-64 of an inch in the smaller passes. In all the squares, the corners of the rolls should be filleted, so that they will be as wide as those at the opening of the pass between their collars where the rolls come together, so that the rod will not have two long and two short corners, it being necessary in order to make a uniform sized rod as possible, to have the corners of equal diameter. In all roll trains, particularly wire rod passes, it is necessary to obtain as large an output of metal as possible. One of the most important details to this end, is a proper division of the work throughout the mill, that is, to so arrange the passes in different sets of rolls so that no one pass or set shall be overcrowded, or delayed in waiting for others. Passes designed especially for wire rods adapted to the modern wire mill with its enormous production, need modifying before they would be suitable for use in a train for rolling small merchant rods that are to be straightened and cut to lengths. It is much better and more satisfactory in every way to design passes, and specially adapt them to the train in which they are to be used and also to the size of the billet or pile they are to be used with. The grade of stock is also an important consideration; as a hard, even grade of metal can be reduced more rapidly than a soft or irregular grade. Conditions like these, with others, vary in almost every mill, and it does not follow by any means that, because a series of passes works well in one mill, or train of rolls even, that it will do the same in every other under different circumstances. Trains for rolling small merchant rods in the

Dimensions of passes for wire rods reducing a 4 x 4 inch square billet down to 0.207 thousandths of an inch, a number 6-rod.

No. of pass	Name of pass	Size of square	Reduction in area	Angle of pass deg.	Width of oval	Depth or thickness of ovals
1	Box Pass	$4 \times 2\frac{3}{4}$	0.15	100		
2	Edg. Pass	$2\frac{3}{4} \times 2\frac{3}{4}$	0.15	95		
3	Oval		0.735		4.183	1.52
4	Square	1.7	0.50	90		
5	Oval		0.70		2.612	0.9506
6	Square	1.076	0.47	90		
7	Oval		0.64		1.734	0.598
8	Square	0.703	0.43	90		
9	Oval		0.57		1.1932	0.388
10	Square	0.478	0.38	90		
11	Oval		0.49		0.6367	0.2626
12	Square	0.341	0.32	90		
13	Oval		0.39		0.656	0.148
14	Square	0.258	0.26	90		
15	Oval		0.26		0.536	0.124
16	Square	0.209	0.19	90		
17	Oval		0.18		0.3592	0.1498
18	Round	0.207	0.10			

Above is the finishing round size of the finished wire rod.

average guide mill have rolls of small diameter, they usually being eight or nine inches in diameter, and using billets weighing from 12 lbs., and upwards. The billets being small and being worked through the several passes, each end being in the passes alternately, the result being that there is hardly a perceptible difference between the first and last ends of the bar when finished. As to the difference in size between the first and last ends of a rod it is due apparently to the difference in temperature, directly or indirectly. Rollers on bar and guide mills know, that outside of the train, any irregularity in the working of the bar or rod indicates one or two things, namely, uneven heat or a stock of variable density, such as scrap, which in these days is liable to contain anything from Norway iron to tool steel. In the case of uneven heat in the length of a bar, such as a series of hot and cold spots on the bar, the cold spots will resist the rolling pressure and spring the rolls the result being that the bar will be larger in diameter on the cold part than it will be on the hot portion. Should the hot part of the bar be unusually hot in comparison to the cold spot, the rolls in springing back into position after encountering the cold spot, will compress the hot metal and cause the bar to be marked at the joints of the rolls. Should an unevenly heated bar be in a pass next to the finishing one, it will cause the finishing pass to overfill slightly and mark the finished bar.

These are well known manifestations occurring in the daily working of iron and steel, and they show that the variation in the size and contour of the rod under normal conditions is due mainly, if not altogether, to the difference in temperature at which the rod passes through the finishing rolls. Therefore we may infer from this, that the quicker the rod is run through the rolls, the more uniform in size it will be, and that an invariable size and uniformity in section is impossible in the rolling of wire rods. Another factor contributing to the lack of uniformity in the gauge of wire rods, is due to the thrust exerted by the other rolls upon the finishing ones, it being customary to roll a number of rods at one time in order to get a large tonnage output. The shape of the rods are not round, but are accepted as marketable in the United States when they are No. 5 gauge one way, and No. 7 another. True, in a lot of 1,000 tons, quite a large proportion will be 5 by 6 and some may even be found 5 by 5 gauge. When a roller in a wire rod mill sets the rolls to make a number 5 rod by means of trial bars, he adjusts his rolls so that the finishing ones will make a rod that measures 5 by 5 gauge over all of the sides; but the stresses set up in the mill soon throws the sizes out of balance, the thrusts of the metal in the different sets and the wear on the brass bearings contributing to this result.

As there is only a few thousandths of an inch difference between a rod that is number 5 one way, and number 7 the other, the variation is remarkably small when we consider that from six to eight rods are being rolled at one time; each rod being at a different temperature, exerts a vibration and thrust on the finishing rolls that alters the sizes of the rods. As wire rods are to be drawn through dies, which makes them into round wire, the lack of accuracy of gauge is accepted, but would not be tolerated in any other finished sections in iron, steel or the non-ferrous metals. The customers demands are becoming more exacting in this respect every year.

ORGANIZING TO PUT IN BRITISH GOODS

Representatives of British Manufacturers Have Meeting in Toronto and Montreal

The Canadian Association of British Manufacturers and their representatives has been established with branches at Toronto and Montreal. Similar associations have existed in Australia and New Zealand for several years. The objects of the Association as set forth in the constitution are as follows: To further the interests of British trade throughout the Dominion of Canada and to affiliate with and work in concert with kindred associations in other centres of the Dominion having similar objects.

Provisional committees were appointed to draft the constitution of the association. The Toronto committee comprised:

Mr. G. A. Marshall, chairman (steel); Captain Harris (shoe polish); Mr. A. C. King (dry goods); Mr. C. W. Beal (pottery); Mr. E. V. Pannell (aluminum); Mr. H. Wilson (dry goods); with Mr. F. W. Field, the British Trade Commissioner in Ontario, acting as secretary pro tem of the committee. The Montreal committee comprised:

Mr. J. H. Peattie (dry goods); Mr. G. H. Bishop (dry goods); Mr. F. H. Scott (silver and electro plate); Mr. A. K. Drury (heavy metals); Mr. F. I. Spielman (paints, etc.)

These committees drafted a uniform constitution.

Those interested in the formation of the association naturally wish to increase Great Britain's share of the import trade of Canada. As Canada is buying a considerable volume of merchandise abroad each year, it is desired that the United Kingdom shall obtain a substantial share of that business. It is felt that the progress which Canadian manufacturers have made, especially during the past few years, will be exceeded by the manufacturing developments in Canada in the future. This is recognized as a welcome and gratifying feature, because as each unit of the British Empire becomes stronger industrially and agriculturally, each developing its resources, so will the great British Empire grow in stability, prosperity and influence.

The executive council of the Toronto branch of the new association comprises:

J. Wilson, president (dry goods); G. A. Marshall, vice-president (steel); H. V. Andrews (wools); C. W. Beal (pottery); Captain Harris (shoe polish); J. Haywood (groceries, coffee, etc.); E. V. Pannell (aluminum and electrical lines).

The executive council of the Montreal branch will probably be elected in the near future.

The government of the association consists of a supreme council, and each branch of the association will have its own local executive council. The supreme council will consist of the chairman and one councillor from each local executive. The association will consist of British subjects only.

(a) British manufacturers and wholesale exporters from the United Kingdom.

(b) Representatives and agents of British manufacturers and wholesale exporters from the United Kingdom.

No representative or agent of British manufacturers who enters into any agency agreement with, or in any way represents any manufacturers or wholesale exporters whose principal works or place of business are situated in any country deemed by the supreme council to be or to have been hostile or unfriendly, will be entitled to membership in the association.

Assistance in the formation of the new association has been rendered by Mr. G. T. Milne and Mr. F. W. Field, the British Government trade commissioners in Canada.

There are several hundred manufacturers of the United Kingdom represented in Canada by branch houses or agents and it is anticipated that a large number, both of British manufacturers and their representatives will enrol as members of the new association.

A substantial number have already been enrolled.

NEW WAYS OF RAILWAY SIGNALLING

British engineers built the pioneer railways in all parts of the world, and have left their stamp even upon the details of equipment. Thus the methods of signalling adopted on railways are generally a direct evolution from the British system. The development of power-operated instead of hand-operated signals has increased the safety and reliability of signalling, replacing the heavy labor of former days with the simple movement of an electric switch. Some railway engineers prohpesy that in the near future all signals will be worked by electric power, and that the clear position will be up instead of down. At present a signal arm accidentally dropped may give a false "clear" indication. In connection with the "up clear" arrangement a British railway has adopted an ingenious arrangement of light signals to replace the old familiar red and green lights. When the signal is at danger, four white lights show in a horizontal line. At "caution" they stand at an upward angle of 45 degrees. At "clear" they are vertical. There is no change in color, as the distinctive position of the lamps is enough to give an unmistakable indication. The mechanism operates not by moving lamps, but by switching on either the horizontal, the sloping or the vertical row automatically as the signal is operated. Only four electric wires are needed to control the mechanism.



The Booth-Hall Electric Furnace

A Conducting Hearth Electric Furnace Having Auxiliary Electrode for Starting. Automatic Control and Careful Design Produce Economical Operation

By W. K. BOOTH
Chief Engineer, Booth, Hall & Co., Chicago

THE principal difference between the various makes of electric furnaces is the method in which the power is introduced in the furnace. The general metallurgical operations of practically all electric arc furnaces are the same. The method of power regulation bringing the power to the furnace frequently means greater or less cost in furnace operation, and governs, to a considerable extent, the manner in which the furnace lining may be put in and consequently the refractory cost and the loss of time due to furnace shutdowns.

Electric furnaces may be broadly divided into two classes.

1. Vertical arc furnaces:
 (a) Conducting hearth.
 (b) Non - conducting hearth.
2. Horizontal arc furnaces.

It is not the purpose here to enter into a discussion of the merits of the various types of arc furnaces, but more particularly to describe a new type of electric furnace, which has been developed during the past year and a half, and which is known as the Booth-Hall electric furnace.

The Booth-Hall electric furnace comes under class 1-a above, and is illustrated diagrammetically in sketches Figs. 1 to 4, and in the photographs from operating furnaces.

Fig. 1 is a longitudinal section of the two-phase electric furnace, with the auxiliary electrode furnace resting upon the charge and arcs drawn between the main electrodes and the charge. A pool of metal is shown forming on the hearth of the furnace.

Fig. 2 is a diagram of a transverse section of the two-phase electric furnace, showing the crossing action of the current in the bath, and the grids embedded in the hearth.



ONE AND ONE-HALF TON BOOTH-HALL FURNACE IN POURING POSITION.

Fig. 3 is a diagrammatic representation of the electrical connections for the two-phase electric furnace, employing two single-phase, Scott-connected transformers. This diagram shows the connections from the transformer terminals to the main electrodes and to the auxiliary electrodes and grids. A two-phase electric furnace so connected gives a balanced load on a three-phase power service. The auxiliary electrode is shown in black.

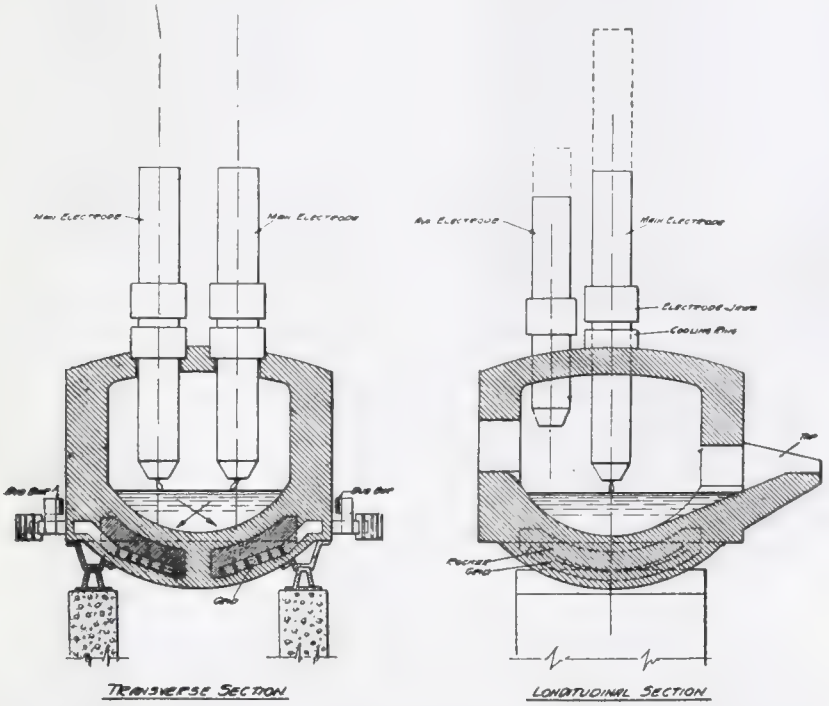
Fig. 4 shows diagrammatically the arrangement of main and auxiliary electrodes in single, two and three-phase Booth-Hall furnaces. The auxiliary electrodes are shown in black.

The furnace is built either in single, two or three-phase to suit the conditions at the place of installation, the general principle being a furnace having a solid hearth which becomes conductive of electricity when hot, and the use of an auxiliary electrode which acts as a return for the electric current until the hearth becomes heated and conductive.

In starting furnace operation on a cold charge the auxiliary electrode is lowered until it rests on top of the charge, and the arc is then drawn between the charge and the main electrodes or electrode, as the case may be, the auxiliary, acting as a return for the main electrode or electrodes. The auxiliary is so arranged that it presses with its entire weight on top of the charge and consequently no arc can form underneath the auxiliary: experience has demonstrated that no arc forms. The auxiliary is connected in parallel with the conducting hearth, and when the main electrodes or electrode have melted enough metal to form a pool on the bottom the hearth becomes conductive and

William K. Booth, Chief Engineer of the Booth-Hall Company, is the patentee and designer of the furnace, and a graduate of Ohio State University. He was identified for several years with the Snyder Electric Furnace Co. He is a member of the American Electrochemical Society, associate member of the American Institute of Electrical Engineers, and a member of the Iron & Steel Institute of Great Britain.

the auxiliary is withdrawn from contact with the charge. In a cold furnace the auxiliary is in operation from thirty to forty-five minutes, and in a furnace that is hot, less than fifteen minutes; that is, only long enough to assure a



FIGS. 1 AND 2—TRANSVERSE AND LONGITUDINAL SECTIONS OF BOOTH-HALL TWO-PHASE FURNACE

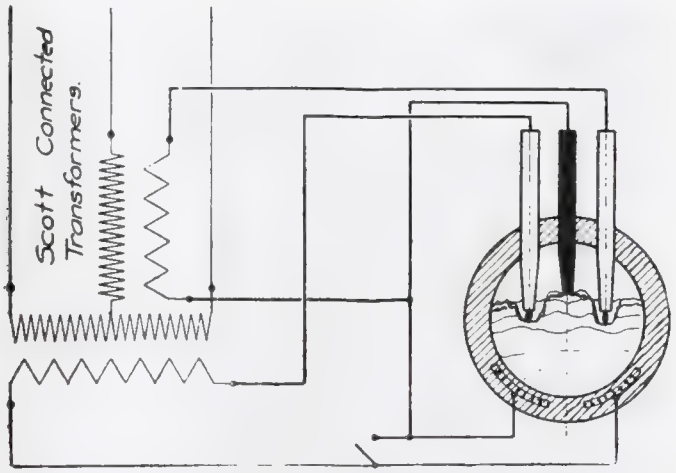


FIG. 3—ELECTRICAL CONNECTIONS OF BOOTH-HALL TWO-PHASE FURNACE

positive start of the furnace and a balanced load on the power company's line.

Furnaces from one-half to six tons holding capacity are generally built for two-phase operation, taking power from three-phase service by means of Scott-connected transformers, as shown diagrammatically in Fig. 3. In the hearth of the Booth-Hall two-phase electric furnace two sets of grids are embedded, which are electrically insulated from each other and are so related to the main electrodes that the current of the two phases crosses in the bath, thus giving a maximum of circulation of the molten metal and causing, in conjunction with the effect of the bottom heating, a very thorough mixing of the metal in the bath. This action can be readily observed in looking into the furnace after the charge has entirely melted. The conducting grids are placed as far as possible from the heated interior of the furnace, and experience has shown that they never become over-heated or require special cooling. The grids are so constructed as to handle large currents, furnishing large areas of contact with the material of the conducting bottom, and preventing local heating due to contact resistance.

By use of the auxiliary electrode a positive start of the furnace is guaranteed, and there is no possibility of failure to secure contact. Each main electrode is independent of the other, as there are no arcs in series, and consequently the regulation of the furnace is very simple, giving a balanced polyphase load on the power service lines. As with the two-phase connection there are only two electrodes to regulate, this offers the minimum number of electrodes for a balanced polyphase load, and the smaller the number of electrodes requiring regulation, the smoother becomes the furnace operation.

The hearth is either acid or basic, as desired, and in each case, the bottom is at least 24 inches (60 cm.) in thickness, being sintered in place layer by layer and forming a monolithic mass. By using the main electrodes in conjunction with the auxiliary, the materials of the hearth are sintered together in thin layers similar to open-hearth practice, thus forming a very durable bottom, and making the danger of run-outs a minimum. The

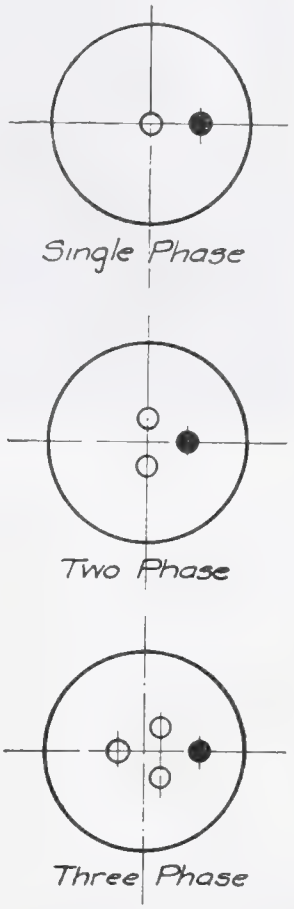
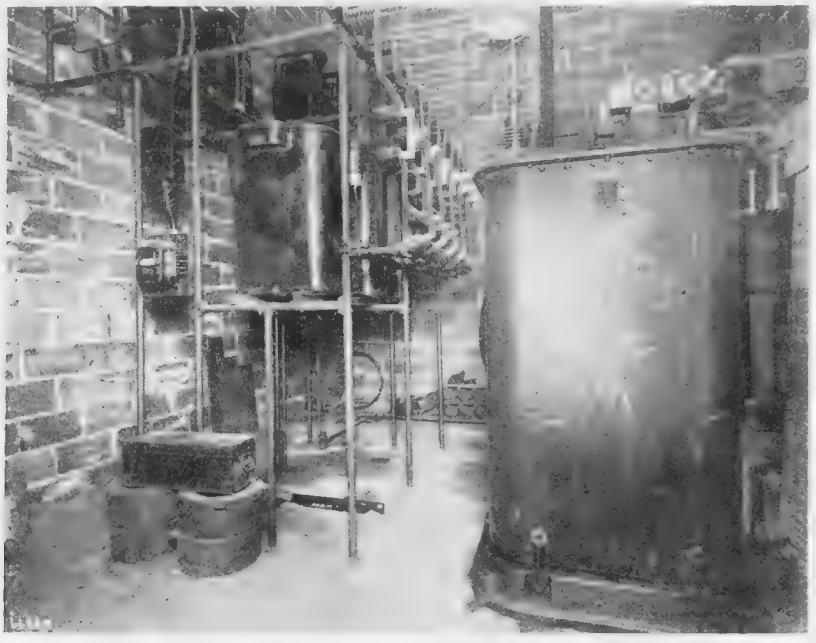


FIG. 4—DIAGRAMMATIC REPRESENTATION OF ELECTRODE ARRANGEMENT.

furnace hearth is consequently solid, with no water cooling of any kind. With the basic hearth, dead burned dolomite or magnetite is used to maintain the slag line; in the acid furnace ground ganister is used for the same purpose. The conducting hearth gives a uniform bottom heating of the entire bath, prevents sculls and makes speedier and more thorough distribution of the heavier alloys, which tend to sink to the bottom of the bath. The effect of this bottom heating is considerable, and has been accurately measured on Booth-Hall furnaces in continuous operation.

With the two-phase electric furnace a mimimum of electrode consumption is secured, due to the fact that a minimum number of electrodes for a balanced polyphase load is used. This means less electrodes to handle, less electrode breakage, and less surface burning. The loss on the auxiliary electrode is small because it is in operation for such a comparatively short time. The electrode jaws are made so that the electrodes can be gripped or released by turning a handwheel or lever at the side of the furnace, and it is not, therefore, necessary for the mel-

ter to climb on top of his furnace when changing the grip on the electrodes. The electrode jaws are arranged in segments so as to take up and adjust themselves to the inaccuracies in the surface of the electrodes.



TRANSFORMER ROOM SHOWING OIL SWITCHES AND TRANSFORMER.

A roomy charging door of special construction is provided in the rear of the furnace and another door provided in front over the tap. This construction is very similar to the open hearth and permits a battery of furnaces to be arranged side by side and a charging machine to serve them all.

The furnace tilts or rocks backward as well as forward, and slagging operations can be handled either from the rear or front as desired. The door is shown in the various photographs. It is designed so that it comes flush against the door frame, sealing the opening, and cannot swing open of its own accord. This prevents air getting into the furnace and also prevents excessive losses of heat through the door. The door can be opened anywhere from a few inches to a full open when inspecting the bath, taking tests or pushing scrap from the sides of the furnace into the bath, thus protecting the melter from the heat of the furnace and preventing great radiation loss. Any warping of the door or frame does not affect the operation of the door or its sealing of the opening when closed.

The furnace is motor tilted, in all sizes, for pouring, but is arranged so that it can be tilted up by hand in emergency if the motor fails to operate. The smaller sizes of furnace are built for hand operation only if desired. All parts of the tilting mechanism, including gears and motors, are arranged so that they do not come beneath the furnace, and, therefore, there is nothing under the furnace that can be injured in case of a run-out.

The main electrodes are arranged for automatic regulation and also, in every case, so that they can be regulated by hand in case the regulators or motors should require repair.

The importance of power control is universally recognized, especially when refining operations are carried on. In the Booth-Hall electric furnace the power input can be maintained at any point from one-fourth to full load by means of proper voltage reduction and control switches. The average power factor will run between 90-95 per cent.

In making steel for the ordinary grade of steel castings, the Booth-Hall electric furnace has operated with a power consumption as low as 446 kilowatt hours per 2,000 pounds (906 kg.) of steel poured, but the average will run between 500 and 550 kilowatt hours per net ton, for continuous operation. In one of the three ton furnaces a considerable quantity of tar phosphorus pig iron has been made, running under 0.035 per cent. in phosphorus and sulphur, also special steels requiring refining with two or more slags; the power consumption, of course, depending upon the degree of refining required.

Although the Booth-Hall furnace has been on the market only a year and a half, furnaces have been placed in operation or are under construction for the following companies:

Midland Electric Steel Co., Terre Haute, Ind.; 3-ton furnace (basic) (ingots and pig iron).

Avery Co., Peoria, Ill.; 2 1½-ton furnaces (basic) (castings).

Duriron Castings Co., Dayton, O.; ¾-ton furnace (acid) (special).

West Michigan Steel Foundry Co., Muskegon, Mich.; 3-ton furnace (basic) (castings).

Queen City Foundry Co., Denver, Col.; ¾-ton furnace (basic) (castings).

Monroe Steel Castings Co., Monroe, Mich.; 1½-ton furnace (acid) (castings).

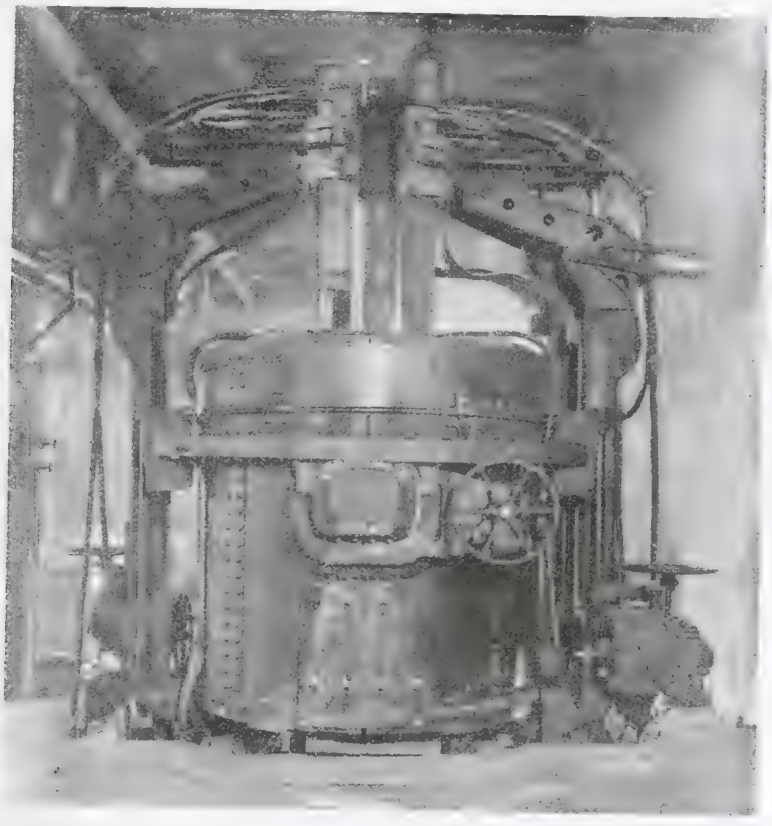
New England Steel Castings Co., East



SWITCHBOARD AND AUTOMATIC ELECTRODE CONTROL.

Longmeadow, Mass.; 1½-ton furnace (acid) (castings).

Four Wheel Drive Auto Co., Clintonville, Wis; ½-ton furnace (acid) (castings).



REAR VIEW OF ONE AND ONE-HALF TON BOOTH-HALL FURNACE

Ecorse Foundry & Machine Co., Ecorse, Mich.; 3-ton furnace (basic) (castings).

Consumers Steel Corporation, Chicago, Ill.; 3-ton furnace (basic) (tool steel) .

DON'T TAKE IT FOR GRANTED

By D. MIDDLETON

Many of the mistakes and delays that occur in the machine trade come from taking things for granted; and the things which are taken for granted turn out to be different, when a searching investigation is made. Though they may be trivial in themselves, their effect may be far reaching and of the multiplying kind that spreads and spreads. A machinist in the repair and jobbing business should be the last person in the world to take anything for granted, yet the temptation is strong when the information comes from reliable sources.

Over at the steel plant they had a small pump that served the furnaces with fuel oil. It had got out of order and the engineer had done his best to fix it up. Finally they sent for a machinist from a nearby shop. The trouble was in the steam end of the pump, and, being of the single cylinder type, the machinist naturally suspected a shifting of the valve mechanism or some sticking of the chest piston. Inquiry of the engineer brought out the fact that the cylinder and piston were all right and in good working order—he had had the head off that morning and made a thorough examination of both. These parts are so familiar to any engineer and so simple that the machinist took that part of the work for granted.

His investigations were directed toward the valve gear and he spent a couple of hours trying to make the pump work, but to no avail; the piston would run one way all right, but would not come back unless given a start. In desperation, he took off the cylinder head and found the piston loose on the rod, almost a half inch of play there. How that had occurred, how it had escaped the notice of a supposedly competent engineer were not explained. But, when tightened up, the pump ran beautifully.

Another plant had installed a new heating system, doing it in the summer well in advance of the severe winter of 1917-18 so there would be no hitch to delay the war work on which they were engaged. A trial was made of the plant at the time and it seemed to be all right, but a trial in zero weather would have been more a test under actual load conditions. When started up in the late fall, the boiler did not seem to draw well and the firm who put in the plant was asked to make it right. They did everything they could, and yet the draft was poor. They finally fell back on the excuse that the stack was low and the fuel bad. These conditions were remedied and still no results. A representative of the factory making the boiler did no better.

A local machinist took a look one day, just out of interest. "I believe you'll find it's damper trouble," he said. And true enough it was. When set for wide open, it was only half open. A freak casting had caused the trouble, and instead of the squared end and flattened centre being proof against mistakes, the twist in the casting had thrown everything out. Everyone had taken it for granted that those parts, which were made "positive," were so, and had built upon that foundation.

We had figured out the speeds and pulleys and shafts for the new printing plant and after it had been going a week, they called us up to say that some of the presses were not running as they should. The press room was so shaped that quite a number of belt drives were required—these were driven by one large motor, which the electric company had put in. The motor we had never seen, but the electric company said it was of 1,200 r.p.m.: it had met with an accident in shipping and the pulley been broken; we had supplied a new 8 in. pulley to fit, along with all the other pulleys in the press room.

Knowing that the pulleys were all correct for the speeds desired, we suspected belt slip, and sent a man over to treat the belts and to take up any that had stretched. He did this and there was some improvement, but not speed enough yet. The motor was set on a frame up near the ceiling, and climbing up there I read the name plate, "Full Load Speed, 1,120 R.P.M.", and trying an indicator I found it to be but 1,110. There was the trouble in taking for granted the electric company's statement of speed, which was really 90 r.p.m. too high.

The file plant used fuel oil for their furnaces and forges, but had one small furnace used for hardening specials that was fired by city gas with a positive pressure blower built into the set. They had so much of this work that the furnace was kept busy all the time. However, it was not satisfactory in operation, because the heat could not be maintained constant—when regulated just right, it would gradually lower and the work cool off—if a trifle above the "just right," the heat would increase to the burning point. Different burners were tried without success; a receiver was attached in an effort to steady the flow of air. No results. By constant juggling of the air valve, a good operator could keep his fire fairly even, but it was a source of trial and a waster of time.

A visitor in the plant stopped for a few minutes to watch the work at this furnace. Without knowing of any trouble, his glance fell on the valve in the air pipe. He must have been a man of observation or have had practical experience, for he remarked: "I thought I saw that valve wheel move a little then." That chance remark showed the difficulty. The valve stem was just loose enough to turn with the pulsations

(Continued on page 439)

The Bessemer Process of Steel Manufacture

A Continuation of How Steel is Made in the Big Mills Using the Bessemer Process—One of the Most Spectacular Performances Witnessed in Industrial Life

CANADIAN MACHINERY has published previously two sections in the story on the Bessemer process of steel manufacture. The following is the synopsis of the first and second chapters, together with the third section. The material is written by P. N. Case, former mixer foreman of the Bessemer mill of the Lackawanna Steel Co., and is taken from the *Dragon*, the house organ of the Fafnir Bearing Co.

Synopsis of Chapters I and II

In the initial chapter of this article which appeared in the February issue of the *Dragon*, we observed: (1) that generally speaking, the manufacture of steel is a refining operation, in which the excess of impurities, such as carbon, silicon and manganese, are removed from the pig iron; (2) that in the Bessemer Process those impurities are "burned" out of the pig iron by means of an air blast; (3) that the "burning" or, strictly speaking, the oxidation of those impurities is very rapid and generates all of the heat necessary for the process; (4) that the oxides of the impurities thus formed, being lighter than metallic iron, make a layer of slag on the surface of the metal, from which they are subsequently separated; and, finally, that to the virtually chemically pure iron (containing only the original phosphorus and sulphur, and traces of other elements) which is left, the proper amounts of carbon, silicon and manganese are added to impart to the finished steel the desired percentages of those elements.

In Chapter II. printed in the last issue of the *Dragon*, we saw: how the pig iron from the blast furnace is transferred in ladles to the Bessemer, where it is stored in the mixers until needed for charging the vessels; that the Bessemer vessel is simply a refractory lined container, open at the top and pierced at the bottom by tuyeres through which the air blast enters; how, in order to prevent the molten iron from running down into the tuyere openings, the vessels are charged while lying flat, in which position they are held until the blast is turned on; and that the blow is directed by the blower and his assistants who are stationed on a platform, called the stage, which is located directly in front of the vessels on the opposite of the mill.

Chapter III.—A Continuation of the Story of How Steel is Made in the Bessemer Mill

The control of the blow and the sequence of chemical reactions which take place inside of the vessel are extremely interesting. While too complicated to be considered in detail in an article of this nature, a general description of these chemical changes, and the phenomena attending them, should prove enlightening to many of our readers.

After the blast has been turned on, the silicon is "burned" (oxidized) first; since, at the existing temperature, that element has the greatest chemical affinity for oxygen. This is the initial period of the blow, and usually lasts several minutes. Moreover, during this period, the temperature of the molten metal is greatly increased. This is because the oxidation of silicon is accompanied by the generation of a large amount of heat. Furthermore, since the oxide of silicon is not volatile, the heat thus generated is largely retained by the "bath" of metal.

Next the manganese is oxidized, and finally the carbon. It is very evident when the carbon begins to "burn" since this stage of the blow is marked by the formation of an increasingly large, and very luminous, flame. This is because carbon monoxide (CO) is volatile and is carried out of the mouth of the vessel by the force of the blast. As it comes into contact with the atmosphere, the carbon is further "burned" to the carbon dioxide (CO^2) resulting in the above mentioned flame. At this point, it will be appreciated that since the products of the combustion of the carbon are immediately lost, very little heat is thus utilized in raising the temperature of the bath. This is the final stage of the blow, and when the carbon is about all consumed, the iron itself begins to "burn" appreciably. This marks the end of the blow, and we will now see how the blower determines it.

During the final stage of the blow, when the last of the carbon is being consumed, the flame pales ever so slightly so that only an experienced eye can detect any change. A few seconds later, the flame shows symptoms of becoming ragged or frayed out at the edges, and has a tendency to shorten or drop—which accounts for the expression, "drop of the flame"—marking the end of the blow.

Notwithstanding erroneous statements which have frequently been made, the "drop of the flame" is not accompanied by any such radical change as the name would seem to imply. On the contrary, the change is so slight that only an expert can observe it. To be sure, if the blow were continued too long, the appearance of the flame would undoubtedly become greatly modified, but this would also result in ruining the "heat" of steel. Thus one will appreciate the responsibility of the blower who not only determines the drop of the flame, but also controls the blow from beginning to end.

For instance, it is essential that the temperature of the metal in the vessel be kept within limits—neither too hot nor too cold. In the former case, the blower cools the "bath"—as the molten metal in the vessel is termed—either by injecting into the vessel live steam which absorbs heat when it is decomposed, or by dropping steel scrap into the vessel's mouth. In case the bath becomes too cool, the blower lowers the vessel and allows the blast to impinge with great force over the surface of the metal, resulting in very rapid oxidation which quickly raises the temperature of the bath. When it is considered that the blower is obliged to direct several blows in different vessels simultaneously, the reader can form some conception of the intricacies of his task. Moreover, aside from knowing the estimated chemical composition of the pig iron in the mixer furnished him by the mixer foreman, the blower must depend entirely upon the appearance of the flame.

It was a hobby of mine to study the flame, and I recall one time in particular when I had bragged about my ability to detect the drop of the flame. So Dan McCrory, who was the blower on my shift, had me stand in front of him (he was a foot taller, so I didn't obstruct his view) where I could not observe his movements. Dan allowed the blow to continue for a few seconds after I gave the signal, but later confided to me that I had hit it right, but that he did not want to give me the satisfaction of knowing it.

At the "drop of the flame," the blower signals his assistants, who are poised at the levers in expectancy, and down comes the vessel again to an horizontal position. Let me say right here that a fellow is kept mighty busy watching the vessels and dodging the shower of fire which ensues forthwith when one is lowered; and this in addition to cranes overhead and locomotives all around pushing and hauling ladles of hot metal, which slop over first on one side and then on the other. Hardly a man who has worked many years in the mill but can show the ugly scar of a frightful burn. Once, a ladle of metal tipped over on a laborer. He never uttered a sound.

and in a few seconds all that was visible were a few charred bones.

After lowering the vessel so that the molten metal cannot run down into the tuyere openings, the blower shuts-off the blast. The metal bath in the vessel is now "white hot," and its temperature is at least 400 degrees Centigrade (720 degrees Fahrenheit) higher than it was at the beginning of the blow, as a result of the heat generated by the oxidation of the impurities in the pig iron. Moreover, the metal is now virtually chemically pure iron, only about 0.05 per cent. of the original carbon and small quantities of several other elements remaining in the iron. Therefore, in reality the metal is now very soft (very low carbon) steel.

The next step consists in the recarburization of the bath—that is, the addition of a definite, calculated amount of carbon and manganese which will introduce into the pure molten iron the desired percentages of those elements. Those percentages vary according to the kind of steel which is being made and the purpose for which it is to be used. For example, steel which is to be rolled into billets or light rails is usually medium high in carbon, containing 0.5 or 0.8 per cent. of that element; on the other hand, sheet bar is soft steel, containing about 0.1 per cent. carbon. However, some additional carbon is essential, in order to impart tensile strength and hardness to the finished product. Moreover, manganese performs two essential functions in the steel; first, it reduces to the metallic state any iron which may have been oxidized during the blow, and, in addition, it neutralizes the injurious effect of sulphur in the metal. That is, they make the metal brittle when hot. Consequently, the addition of at least 1. per cent. of manganese to the bath makes the steel much more forgeable, and this, obviously, is very desirable.

For the purpose of recarburizing the metal, it is customary to use either ferro-manganese or spiegeleisen, commonly spoken of as "spiegel." Both of these substances are merely special grades of iron, containing relatively large percentages of manganese and carbon. From what has been said in the above paragraph, it will be evident that, in making soft steel, much less carbon is required than manganese; and, consequently, in such cases it is customary to use ferro-manganese as the recarburizing agent, since this material contains a much greater percentage of manganese than it does of carbon. Only a little is required, and it is simply preheated in a small furnace and shovelled into the vessel by hand, or into the ladle after the metal has been poured out of the vessel. On the other hand, in making medium high carbon steel, spiegel is employed; and as a much larger amount is required, it is first melted in a cupola furnace and then poured into the converter, followed by a brief blow, in order thoroughly to mix it with the metal. As mixer foreman at Lackawanna, it was one of my jobs to calculate the amount of recarburizing agent to add to the bath. Examples of two simple cases will assist the reader to visualize the manner in which these calculations are made.

Example No. 1—"Soft" Steel

Let us assume that it is desired that the finished steel shall contain approximately 0.1 per cent. of carbon, and that the weight of the heat, or blown metal, is 20,000 lbs. In this case, ferro-manganese is the proper recarburizing agent to use, since only a small amount of carbon is needed. As a last assumption, suppose that our supply of ferro-manganese contains 6.5 per cent. carbon and 80 per cent. manganese.

Then $20{,}000. \times .001 = 20$ lbs. carbon needed

$$\frac{20. \times 100.}{6.5} = 308.$$ lbs. of ferro-manganese

are required to yield 20. lbs. of carbon. Moreover, the blown metal undoubtedly contains a slight amount of carbon, and, therefore, 300 lbs. of ferro-manganese will surely be sufficient to furnish the desired percentage of carbon.

Now $300. \times .80 = 240.$ lbs. of manganese in 300. lbs. of ferro-manganese.

And $\frac{240.}{20{,}000} = .012$. That is, 1.2 per cent. of manganese is added to the heat, which will suffice to prevent red shortness in the steel.

Example No. 2—Medium High Carbon Steel

Next, let us suppose that it is desired to make medium high carbon steel (such as billets or very light rails) containing 0.5 per cent. carbon, and that the weight of heat is again 20,000 lbs. Here, spiegel is the logical recarburizing agent. Finally, let us assume that the spiegel contains 5. per cent. carbon and 20. per cent. manganese.

Then $20{,}000. \times .005 = 100$ lbs. of carbon needed.

$$\frac{100. \times 100.}{5.} = 2{,}000$$ lbs. of spiegel

needed to provide 100 lbs. of carbon.

Now $2{,}000. \times 0.20 = 400.$ lbs. of manganese in 2,000 lbs. of spiegel.

And $\frac{400}{20{,}000} = 0.02$. That is, 2. per cent. of manganese will be introduced into the bath, which is satisfactory.

Occasionally, when the heats are to be used for making light rails, about 0.15 per cent. of silicon and a small amount of ferrotitanium (about 0.1 per cent.) are added, in order to prevent blow holes, which defects might cause a broken rail and, consequently, a bad wreck. Also, in making bolt steel, a high percentage of sulphur is desired, and this is added by throwing bags of sulphur into the ladle after the heat has been poured from the vessel. This is rather ticklish business for the mixer foreman, since if too much sulphur is added, the steel will be unfit for making bolts, and, furthermore, there is no way of knowing definitely just how much sulphur the iron in the mixer contains. I might add, also, that bolt steel is the only instance of which I know where sulphur is not extremely undesirable.

When it becomes time to pour the heat from the vessel, one of the blower's assistants, by means of an hydraulically operated jib crane, swings a casting ladle under the vessel's mouth, while another assistant revolves the vessel gradually downward until the metal is entirely emptied into the ladle. Moreover, during this procedure, an effort is made to retain in the vessel as much as possible of the slag which, as we have already seen, is a viscous substance consisting of the oxides formed as the result of "burning" the impurities out of the metal. After the metal is entirely poured into the ladle, the vessel is revolved bottom upward, dumping the residue of slag into the pit beneath.

The metal is now steel in every sense of the word, although it is a white hot liquid. The next step consists in what is known as "teeming" the steel from the casting ladle into a series of molds which have been pushed into position by a dinky engine through the pit that extends between the vessel floor and the blower's stage. Each of these molds is mounted on a low truck, or "stool," in the wheel hubs of which ball bearings may be applied to excellent advantage. Moreover, a mold is a cylindrical cast iron or steel shell, open at both ends and tapering upward.

Before the molds are sent into the mill, they are sprayed with some sort of sulphurous compound, and the fumes which arise from them are second only to German poison gas. There is no antidote (peach stones will not help) and a man's only salvation is to keep to windward; or, if caught to leeward, to breath through a handkerchief, which serves to strain the sulphur from the pure air.

There is a spout in the bottom of the ladle, and a man, called a "pourer," teems the steel into one of the molds by prying up a stopper in the bottom of the ladle. When the mold is filled, the pourer lowers the stopper, and the ladle is swung over the next mould and the operation is

repeated. This may seem to the uninitiated like an easy job, whereas, in reality, the pourer must possess both skill and "nerve"; one little spatter may relieve him of a foot or two! The ladle holds an entire heat, which is sufficient to fill four average sized molds, which vary somewhat in size according to the kind of steel which is being made. In fact an "old hand" can usually tell what kind of steel is being "blown" in each vessel, merely by observing the size and sequence of the several sets of molds which extend in a line through the pit. In order to assure success of the teeming, it is imperative that the temperature of the steel be high enough so that it will not freeze in the spout of the ladle. Here again we see that Bessemer Process could not exist if the oxidation of the impurities in the pig iron did not raise the temperature of the metallic bath—especially since the melting point of steel is considerably higher than that of the pig iron. When the steel has been entirely teemed into the molds, a small residue of slag (which escaped from the vessel with the metal) remains in the ladle. Owing to its viscosity and because it is lighter than the steel and floats on the surface, this slag, fortunately, does not begin to trickle through the spout in the bottom of the ladle until all the steel is out, when the pourer applies the stopper. Then the ladle is turned upside down, and the slag dumped into the pit. However, it is difficult to prevent the slag from sticking somewhat to the sides of the ladle, forming a "skull" which accumulates and must occasionally be broken off with crow bars. Furthermore, the ladle is lined with refractory clay, and this lining requires frequent patching and must occasionally be renewed.

After a number of sets of molds containing several heats have been filled in this manner, an engine enters at the opposite end of the building and hauls them out to the "stripper," which is an hydraulically operated mechanism having gigantic steel fingers which grasp each mold and lift it off the ingot. The ingots—which by this time have solidified on their outer surfaces—are left standing on the stools. At night, it is very spectacular when these bright, orange-red, ingots are hauled on to the rolling mill. There they are placed in the "soaking-pits"—a "soaking-pit" is a sort of annealing furnace—where the interior of each ingot gradually solidifies, while its exterior is reheated. Eventually, the ingots are brought to a definite, uniform temperature throughout their masses. They are then in condition to be rolled into all sorts of shapes for commercial uses. The rolling mill industry, alone, is a marvelous instance of Yankee ingenuity in devising means for accomplishing big tasks quickly, and I wish that space would permit me to describe some of the remarkable things accomplished in a modern American rolling mill.

Such is the cycle of operations performed in "blowing a heat" of steel. Every effort is made by the blower and foremen to avoid lost time in charging the vessel with pig iron, supplying the recarburizer, teeming into the molds, and in every other operation either big or small. A few minutes' delay may easily cause a "cold" heat; that is, the steel may become chilled before it is teemed. Thus, the reader can easily imagine the activity and excitement which pervade a big mill in which several vessels are being operated simultaneously.

Canadian Machinery Drafting Course---Part III

In This Second Portion We Go Still Further Into the Use of the Drawing Instruments, and Discuss the Various Type of Lines as Adopted in General Drafting Practice

By J. H. MOORE, Associate Editor Canadian Machinery

BEFORE entering this third portion of the course, let us commence with a good-natured warning to students in general: "Do not yield to the inclination of speed only, but be content to travel the road carefully and at a natural gait." We will try and touch only on the absolute essentials, but in this portion especially, where we intend speaking of lettering and section lining, undue haste would be a very bad mistake. For this reason we ask the reader to study this portion with extreme care, especially the section lining department, for once the principle of the idea is grasped the rest will come easily.

In regards to the lettering. There is a belief in certain circles that lettering is non-essential to a mechanical drawing; in fact the writer of this article, personally, heard a certain chief draftsman give instructions to one of his staff to use a fountain pen for lettering and dimension purposes. When asked his reason for such a command the reply was, "It saves so much valuable time." True, perhaps it saved a little time in the drafting department, but what about the shop end of it, where the workmen had to decipher the lettering and dimensions? A system such as spoken of is carrying the time-saving idea too far, for a neatly executed drawing, with poor lettering will never pass muster, in fact the effort spent in making the drawing neat was time wasted, if at the finish the dimensions are carelessly placed and undecipherable.

Still, there is another danger, just as glaring as the one already spoken of. How often we see a drawing, where all the time seems to have been spent on the lettering, while the drawing portion is left commonplace, and perhaps even shows lack of care, yet the lettering is not only perfect, but of the fanciest design possible to make, sometimes, in fact, work that a show-card writer would be proud of. It is therefore of the double danger that we would warn students. We do not wish to take up our readers' time carrying them through

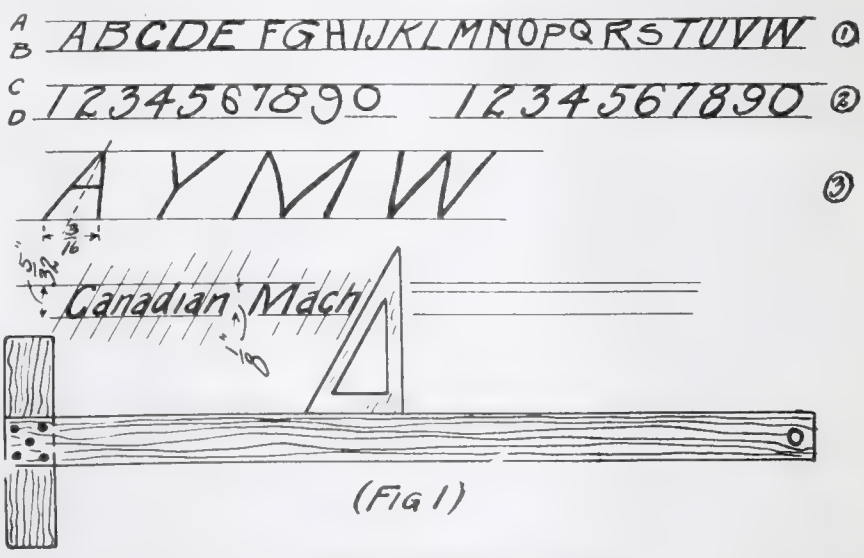


FIG. 1 A SHORT LESSON ON LETTERING

a long painstaking course in lettering, and yet, because we only intend mentioning two styles of lettering we do not wish them to run away with the idea that lettering is non-essential. If the two styles illustrated further in this portion are practised earnestly, students will be sufficiently equipped in the ground-work at least, and have ample knowledge for average conditions.

In the up-to-date drafting room of to-day, wherever possible rubber stamps are used to take the place of the lettering. This particularly applies to the title block, and as the type used is much better than the hand printing, such a method is not only an improvement, but a decided time-saver. For the purpose of our course, we will, as before stated, keep to two styles, namely the sloping Gothic letters, and the block type.

Fig. 1 illustrates how students may practise the Gothic style with the aid of T-square and triangle. To start with it is important that a good pen be used for the purpose. A Gillott's No. 303 pen is ideal for such work. For the purpose of our course we will set a standard to the height of the lettering. This height is clearly shown on the sketch Fig. 1, namely that capital letters are to be 5-32 in. high, and the smaller, or lower-case letters as they are called, are to be ⅛ in. high. As regards the spacing horizontally, no real definite rule can be given, for it is simply a matter of the general appearance that counts. Students will become more proficient in this spacing the more they go on, and the more they practise the more their eye will discern uneven spacing. What would perhaps help the student more than any thing else is to remember these points, that W is the widest letter, M and T the next widest, then A and B. The narrowest letters are I and J, after which all the rest are about equal. A short space of time memorizing these facts will help the student considerably.

Before beginning to letter, draw horizontal guide lines with your T-square to serve as a guide for the tops and bottoms of letters, see lines A, B, C, etc. on Fig. 1. The letters should be made to extend fully up to the top and down to the bottom. They should not fall short of the guide lines, for if they do the lettering will appear ragged and uneven.

It is also very important that the letters have the same inclination. For example letters A, B, C, D and E are shown at correct inclination, then F, G, H, etc., are alternately put at various angles to illustrate the point of irregular slope, also the importance of keeping to the proper guide lines is illustrated by purposely not reaching the proper lines, to show up the irregular and ragged effect.



FIG. 2—THE STYLE OF LETTERING TO BE USED.

To secure the regular slope, use T-square and 60 degrees triangle, as shown in the lower portion of Fig. 1. In lettering make the backs and sides of the letters parallel with these sloping guide lines. A few points regarding the construction of a few particular letters. On line 3, Fig. 1, enlarged twice the actual size, are shown letters A, Y, M and W. To print A draw the centre line at the regular slope; from the apex of the letter draw a line almost perpendicular as shown, and make the distance across the bottom of letter about 3-16 in. wide. Regarding the other letters illustrated, students, by studying the same, will easily grasp the style and principle of design involved. Our advice to the student is this: follow the copy closely, keep on practising, for one can learn more about the lettering subject by actual practice than by any written instruction. Fig. 2 illustrates the complete alphabet and numerals. We now leave the Gothic style and pass on to the block design.

Fig. 3 illustrates the block type, and while at first sight it looks a difficult style, it is in reality very simple, for it in a mechanically produced style of lettering, the T square and triangle completing the entire letter. The letters are to be made 5-16 in. high and ¼ in. wide, except M, which is 5-16 in. wide, and W, which is ⅜ in. wide. The thickness of all lines is to be 1-16 in. The distance between any two letters of a word is 1-16 inch, except where A follows P or F; where V, W or Y follows L, where I follows F, P, T, V, W or Y, where T and A are adjacent, or A and V, W or Y are adjacent. In this case the bottom extremity of A, and the top extremity of P, T, V and W are in the same vertical line, etc. In other words, as before stated, practice will allow the eye to discover proper spacing.

Since these letters are composed of straight lines they can be made with T-square and triangle throughout. The

Announcing the Prize Winners on Plate No. I

1st Prize—Hugh Scott, 27 Helena Ave., Toronto, Canada.

2nd Prize—Frank Spry, 17 Francis St., Galt, Ontario.

3rd Prize—E. M. Belinger, 28 Germain St., St. John, N.B.

If you don't happen to see your name here this issue make up your mind that you will, before this course is finished.

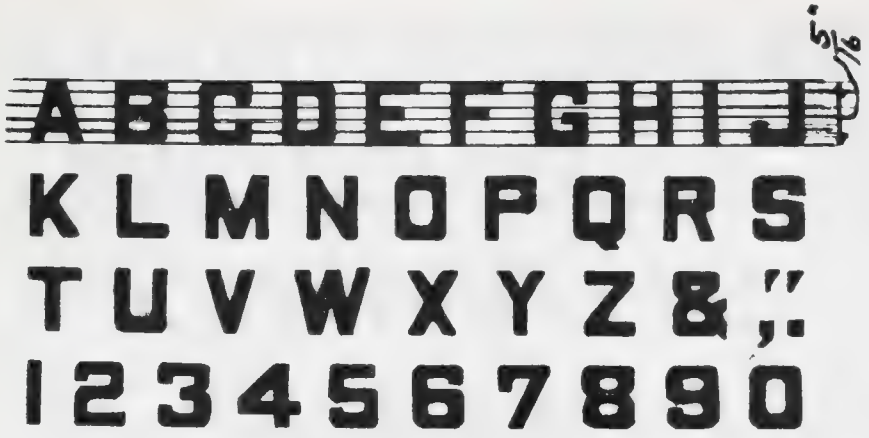
Tear off and send with drawing

Name

Address

Position

Firm's name



(Fig 3)

FIG. 3—THE COMPLETE BLOCK ALPHABET.

student should draw six horizontal lines 1-16 in. apart in lead pencil, to represent the thickness of the letters at the top, centre and bottom: then by use of the triangle he should next draw the letters and the spaces between them, also in lead pencil. Having the letters all laid out, he can then easily ink them in. Use the ruling pen for this purpose. Students nad better ink in all vertical lines first, next the horizontal lines and lastly the oblique lines. By such a method he lessens the chances of blots, also follows the building up of the letters in their natural sequence. Once more the importance of practice work is impressed upon the student if he would become proficient in this work. Leaving the student at this point to practise these two styles of lettering at his leisure, we will go on to section lining, its principles and purposes.

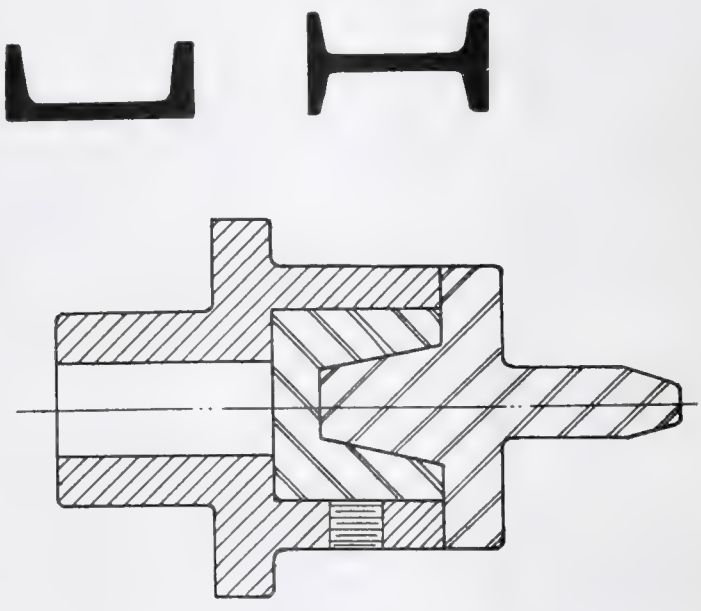
Sections and Section Lining

When we speak of a section through a piece of work, exactly what do we mean? We mean simply this, that to show clearly what otherwise would all be hidden and represented on the drawing by dotted lines, we cut clean through the centre of things, or in fact through any portion of an object, or objects, to show its various details. To make these points even more plain than ever, we section line the various parts by certain lines which represent the material from which they are made. Unfortunately there is no universally adopted standard, thus a certain combination of lines in one drawing office may mean steel, but in another office they might use the same combination of lines to represent some other metal, for instance cast iron. However, in the majority of offices, the combination of lines are alike, and on our plate No. 3, are illustrated these various shadings or section lines, as they are called. Under each space is given a letter of the alphabet, and at the end of this article we have placed in table form the letters, and what each particular section represents. Students should familiarize themselves with these various sections, so that at once they can tell what material a part is made of by its section linings. Where lines are too thin to show section lines they are simply blackened in, as shown on one of the portions of Fig. 4. These blackened sections are most frequently employed for sectional views of structures composed of plates and rolled sections, such as I beams, angle irons, rail bars, etc.

On going further into the drawing question, we will find that section lines do not always run in the same direction, for example refer to Fig. 4. This view shows that there is more than one piece to the section given. It is a general rule among draftsmen that each part of the same piece is section lined in the same direction, irrespective of its continuity of the section, so that by this means, after one has followed up the section method further, they can easily ascertain if at various parts of the section the same piece appears. In a later plate on this course, the student will have to make sectional views from straight sketches, but of course, before we expect him to do this, further information will be given him on this important subject. At the present time the chief idea is to familiarize students with the various lines used in section lining, and their meaning.

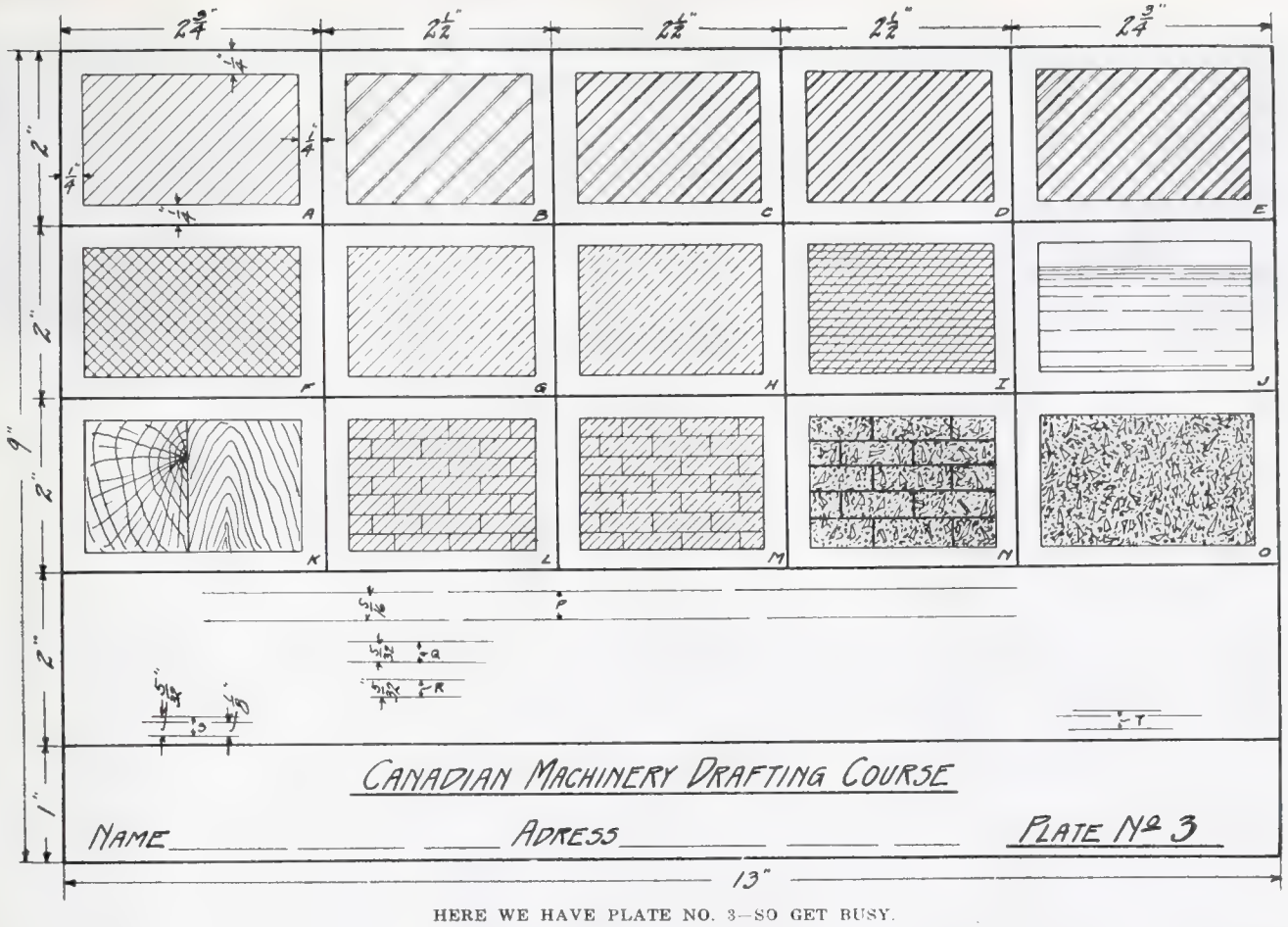
The next plate will go on to practical use of the instruments, as applied to geometrical drawing, and while two or three plates will be taken over in this branch of the subject, it is only because it is absolutely essential that the student get this groundwork before going further into the mechanical drawing question. As stated before, we will not attempt to make this a long, detailed course, but will carry the student along as fast as we possibly can, with the knowledge that he has a chance to follow us. It would be foolishness to proceed faster.

Might we close this portion of the course by asking some questions? Do you like this course? Do you believe it worth while? Is it doing you any good? If so tell us about it by letter. We would like to know that our intentions are being realized, namely to provide an interesting course of use to the shop worker. Are there any points you would care to suggest? We should like to hear them. Last, but not least, keep sending on your work. We are busy receiving replies now, but we want still more. How about it? Dou you want to earn one of the prizes? If so send your stuff along. It may be your plate will land the prize. Referring to plate No. 3: proceed to lay out the border lines as before. Then divide evenly into the sizes given on the plate. Draw up each section as near to the original as possible. The section of this plate devoted to the lettering is left blank for obvious reasons, namely that we wish to see your progress on this subject. To show us this progress proceed as follows: where P is marked make two guide lines 5-16 in. apart, and draw in the words, Canadian Machinery, in block style lettering. Where Q and R is marked print in sloping Gothic capitals 5-32 in. high these



(Fig. 4.)

FIG. 4—THE PRINCIPLE OF SECTIONING ILLUSTRATED.



HERE WE HAVE PLATE NO. 3—SO GET BUSY.

words: Canadian Machinery has a motto well worth while. "To make their paper better this week than last week, advancing all the while." At S and T, make double guide lines, and place these words, in sloping Gothic, with capitals and lower case letters. "The price is $3.00 per year, let us have your subscription now."

Regarding the spacing, that is strictly up to the student. Make it as good as you know how. From your plate we will see how well you have read the instructions. Above all send the plate in.

Table form illustrating what materials the various section lining represents.

A represents cast iron.
B represents cast steel.
C represents malleable iron.
D represents wrought iron.
E represents wrought steel.
F represents copper or zinc.
G represents brass or aluminum.
H represents composition.
I represents insulating material.
J represents water.
K represents wood.
L represents brick.
M represents fire brick.
N represents concrete blocks.
O represents concrete.

BOOK REVIEW

Liquid Steel: By. Col. David Carnegie. Longmans, Green & Co., New York and London. Price $8.50.

In the second edition no changes have been made with the exception of the incorporation of an additional chapter on the "Development of electric steel manufacture in Canada." The author throughout the book has set forth and compared the various items of cost in the different processes of steel manufacture in addition to the descriptive matter pertaining to the various processes themselves.

Information and data of practical use to steel makers generally are given, including:

The analysis and costs of iron ores, pig irons, refractory materials, fluxes, ferro-alloys and fuels, all of which are principally arranged in tabular form for easy reference.

2. The composition of charges for different classes of steel with particulars of the finishing additions required.

3. Details of the construction arrangements and cost of furnaces and plants.

4. Methods of assembling steel works costs and details concerning the value of labor and the costs of living in various countries. These figures are necessarily changed by war conditions.

Materials used in steel manufacture are taken up and dealt with exhaustively and the remaining portions of the work are developed in five parts: the Crucible process, the Bessemer process, the open-hearth process, the electric process and costs and labor.

Over five hundred pages, ten plates and 252 illustrations have been necessary to develop the subjects treated.

WALKERTON.—The town council is considering coming into the market for a motor truck and chemical extinguisher. Their present equipment is in poor shape.

DON'T TAKE IT FOR GRANTED

(Continued from page 433)

of the blower and, when made tight, there was no further trouble with heat regulation. No one had thought that a new valve could be other than right, and so no one had looked there for trouble—it was the old story of the very little thing right at hand.

Our city was justly proud of its new six-storey hotel—the first building with elevators, too. An engineer from the H— elevator Co. had come to go over the proposition, and, their shop being crowded, had put the job out with a local shop to build everything except the machine itself, which they had in stock. The engineer had made inquiry as to the water pressure and been informed by the city engineer that the hydrant in front of the hotel showed 80 lb. at six o'clock in the evening, but that it would be safer to make a test during the day on the hotel service pipe in the cellar.

"That's near enough," said the elevator man, "we need only 60 lbs. for our type of hydraulic elevator." But when the elevator was installed it was found necessary to take off the luggage carrier to permit it to run at all and even then one could ascend the stairs as fast as the elevator would carry at any time during the day. Taking pressure for granted had been a mistake, for it was found by tests made too late that daytime hydrant pressure was only 60 lbs. and by the time allowance for bends and other demands of hotel service had been satisfied, there was not over 40 lbs. left available for the elevator.



WHAT OUR READERS THINK AND DO



Automatic Gong for Vehicles

An Interesting Article on a Safety Gong Which Can Be Attached to Any Moving Vehicle—This Idea Can Be Adapted to All Classes of Work

By L. C. MARTIN

OFTEN it is desirable to have mounted on a vehicle a gong which sounds its alarm whenever the vehicle is in motion. That described in this article and detailed in Figs. 1, 2, and 3 satisfies such requirements. A notable advantage of the arrangement which is to be discussed is that it is extremely simple. Hence it can be made readily and is not liable to get out of order. It is entirely self-contained. Another feature is that the frequency of the sound emitted by it is proportional to the speed of the vehicle on which the gong is mounted. If the vehicle moves slowly the gong sounds infrequently; if it moves rapidly the taps come in rapid succession. Hence, when the vehicle carrying the gong is invisible, the listener can judge easily of the rapidity of its approach. This consideration becomes of considerable importance when the device is used in locations which are dimly but poorly lighted, as for example in mines or in dark, irregular corridors in industrial plants.

Some of the cases in which the automatic alarm may be effectively used are: On trucks in factories, on monorail telephers, on cranes, on mine locomotives and cars and on turntables.

As indicated in Fig. 3, the automatic gong is attached to one of the wheels of the conveyance. Each time the wheel completes a rotation the gong sounds once. At each rotation the steel ball within the tapper cylinder drops against the tapper and thereby makes the tapper strike the gong. A spring is provided which then returns the tapper to normal position where it will be ready to receive the next stroke. In the general assembly of Fig. 1 the relation of the components are shown. The assembled tapper cylinder C may be mounted within any gong, G, which is available. A yoke, Y, of strap iron, holds, by means of two round-head wood screws, the complete device to the back-board, B. The cap screw, S, passing through the hole in the gong and turning into a tapped hole in the yoke, Y, clamps the gong securely in position. A washer, W, is provided between the yoke and the gong so that the gong will be located in the correct location to receive on its rim the blows from the tapper. Spacing blocks, B and B, may, if necessary, be inserted to raise the tapper cylinder away from the surface of the mounting board. The mounting board, with the device assembled on it, may be clamped to the spokes of the vehicle wheel with U bolts, as delineated in Fig. 3.

For very severe service it is better, instead of using wood, to mount the gong on a square of steel plate and then bolt this plate to the wheel. In the accompanying diagrams no attempt has been made to indicate exact dimensions. For each diameter of gong, different proportions are necessary and must therefore be selected in each instance to satisfy the requirements of that specific case.

In Fig. 2 the detailed construction of

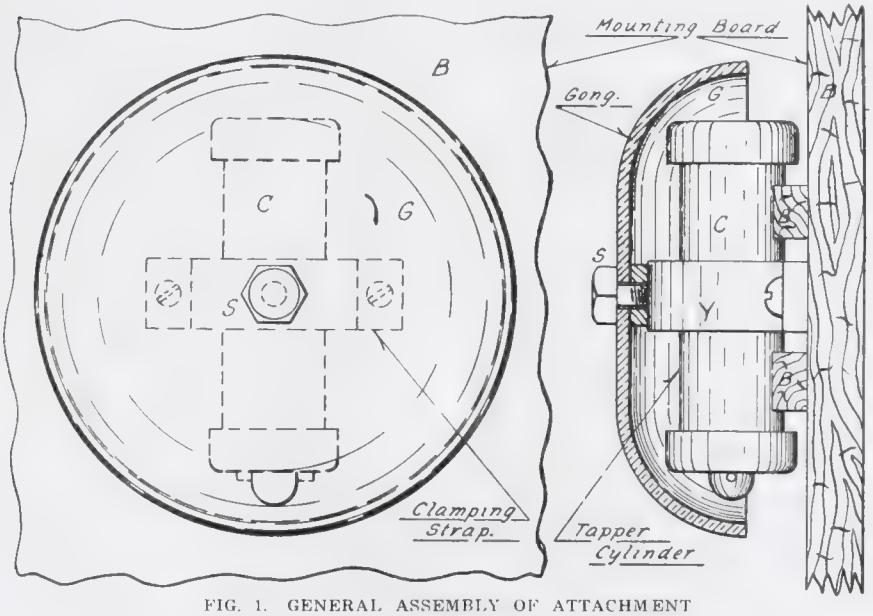


FIG. 1. GENERAL ASSEMBLY OF ATTACHMENT

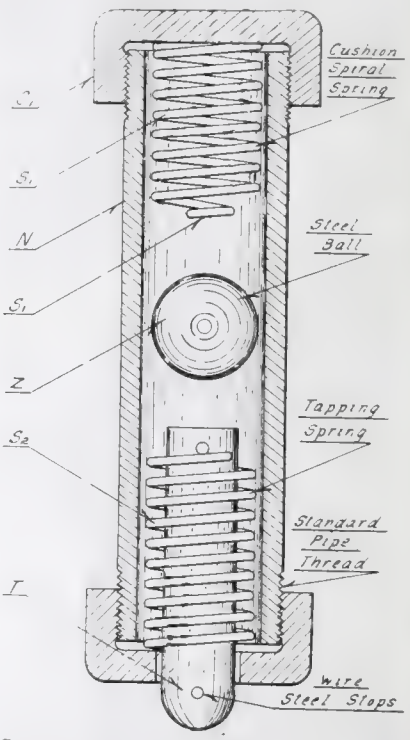


FIG. 2—DETAILED CONSTRUCTION OF THE TAPPER CYLINDER.

the tapper cylinder is diagrammed. A nipple of wrought-iron pipe, N, constitutes the body. Malleable iron pipe caps, C_1 and C_2, are screwed on each end of the nipple. One of the caps, C_2, has a hole drilled through it to accommodate the tapper, T. Two drive-fit pins are

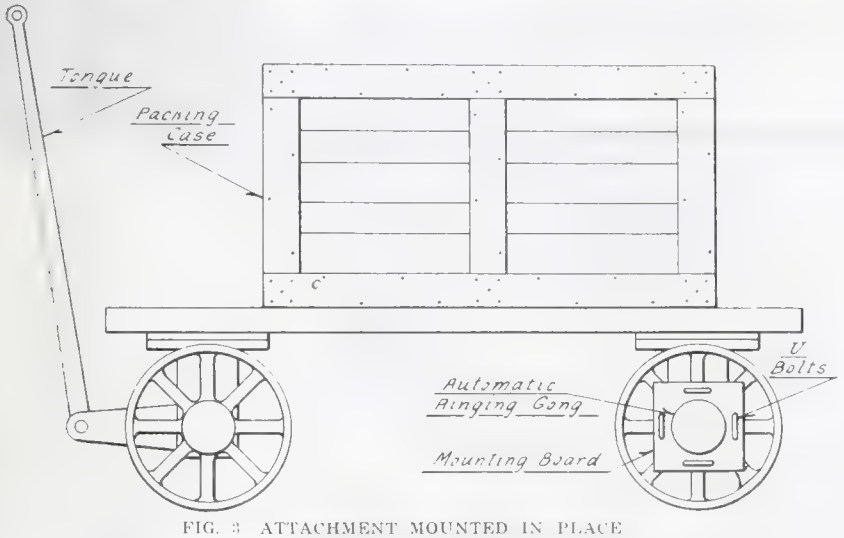


FIG. 3 ATTACHMENT MOUNTED IN PLACE

forced in holes drilled in the tapper to act as stops. Ball Z should be of steel —such balls are regularly manufactured for ball bearings and may be obtained in any one of many different diameters, from almost any machinery supply house. However, if a steel-bearing ball is not available, a chunk of iron of approximately spherical form will suffice. Spring S_2 should be of brass wire, about No. 14 for the average case. Its function is to return the tapper after the ball has struck it and to hold the tapper in position against the action of centrifugal force. Spring S_1 forms a cushion for the ball when it rebounds and may comprise a few turns of relatively light wire, possibly No. 18.

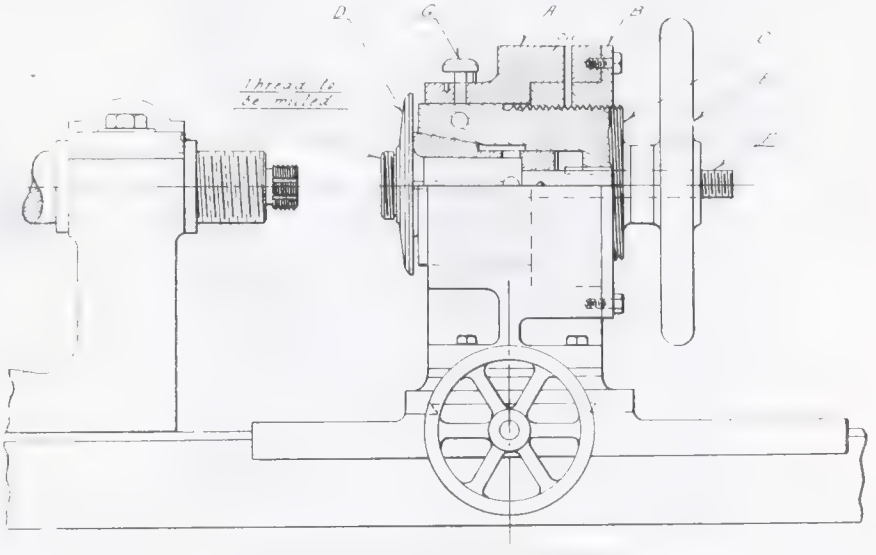
Some experimentation may be necessary in order to locate the tapper cylinder in the most effective position within the gong and to determine the best proportions for the two springs. As the wheel on which the automatic gong is mounted rotates, centrifugal forces act on the ball and on the tapper. Its effects and the expedients which must be adopted to counteract them can be determined only by trial.

HAND-MILLING FIXTURE FOR AUTOMOBILE HUBS

G. BARRETT

The possibilities of adapting "war machinery" to the needs of domestic manufacture is a problem that has, as yet, received little attention, but careful consideration of the requirements of the situation will frequently enable mechanics and engineers to make such additions or slight alterations that will make the machine an economic asset instead of an expensive liability. Changes that were made to one of these single purpose shell machines, for the purpose of milling the short threads on automobile hubs, is shown in the accompanying cut. These hubs were formerly threaded (14 threads) on a screwing machine, but on account of the short length of the threaded portion it was difficult to obtain a good clean thread, as the first two were always torn and too sharp.

The fixture here shown was designed so that these threads could be milled in one of these discarded lathes. The casting A was made to fit on the cross slide and bored to fit the bronze nut B and the bearing screw C, this latter containing the collet chuck that holds the work. In operating the device, the hub D is held in the chuck, which is drawn in by the hand wheel E, the tightening screw F being secured to the collet by a tapered pin, and held in a relative fixed position to the piece C, by the feathered key shown. The bearing screw C is turned around until the hole shown in the section comes in line with the locking pin G, which prevents the bearing screw from turning while tightening the chuck. When this is accomplished the pin is withdrawn and turned a little to hold it out.



GENERAL VIEW OF THE ATTACHMENT

With the milling hob secured in the spindle nose the work is ready to be milled. The depth of the cut is governed by the graduations on the cross feed screw, then the hand wheel E is turned around slowly for a little over a revolution, and the job is finished with a first class thread. As there are many of these old machines available in various shops, this fixture, with the necessary modifications, could very well be adapted to different threading operations and made into a stationary machine.

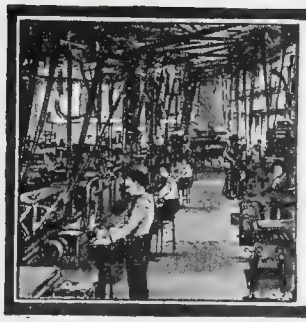
BRITISH LENSES INSTEAD OF GERMAN ONES

The English factory of the famous German firm of Zeiss, which is located near London, has been acquired by two British firms of optical lens makers. The war has proved beyond a doubt that English firms are capable of turning out lenses far surpassing in quality the German ones. Before the war it is estimated that about 95 per cent. of the lenses used in the U. S. were imported.

AMERICAN STEEL FOR BRITISH WORKS

At the annual meeting of the Scottish Tube Company Ltd., in Glasgow, the chairman said that in order to keep the works going they were compelled to seek supplies of material from America, where the works were able to supply suitable steel for tubemaking at a considerably lower price than home makers.

The Bureau of Mines, Department of the Interior, Washington, have issued papers Numbers 207 and 219. Paper 207 deals with combustion experiments with North Dakota lignite and gives an exhaustive summary of the results of numerous tests and trials which have been conducted with this fuel. Technical paper number 219 deals with subject of gas analysis and the necessity for it in the maintaining of proper combustion.



DEVELOPMENTS IN SHOP EQUIPMENT



GREENFIELD RECEDING PIPE THREADER

In working out the design of the new receding pipe threader, which has recently been added to the line of tools manufactured by the Greenfield Tap & Die Corporation, Greenfield, Mass., two special advantages are claimed for it—one, the quick release of the chasers at the end of the cut; the other, the quick resetting to cutting size.

In operation the tool is wound onto the pipe until a thread of the desired length has been cut, after which the threader may be pulled straight off. It is stated that this tool "leads" on easily and that the action of the tool becomes freer as it is advanced onto the work.

No unwinding is necessary to return the threader to its original cutting position. To accomplish this result, it is merely necessary to release the lead screw, lift the head, reset the trigger and begin another cut. It will be apparent that none but the actual cutting teeth of this threader follow around the threads.

The chasers are narrow and they travel along the pipe parallel to the thread they are cutting and not parallel to the axis of the pipe, the claim being made that this condition of operation reduces considerable friction. The chasers are interchangeable and made in such a way that it is possible to replace a single chaser in case of breakage. Under such conditions the replaced chaser will follow or "track" uniformly with the balance of the set, making it unnecessary to buy an entire new set of chasers when one becomes unfit for further use.

At the beginning of the operation, the chasers cut a full depth thread, and as the work progresses the levers which support the chasers gradually change their position, permitting the chasers to recede until they have finally backed completely away from the pipe. Then the threader can be pulled straight off the pipe, avoiding loss of time in unwinding. A single turn of either of three conveniently placed lugs disengages the lead screw, so that the head may be pulled back to the original position and reset at that point.

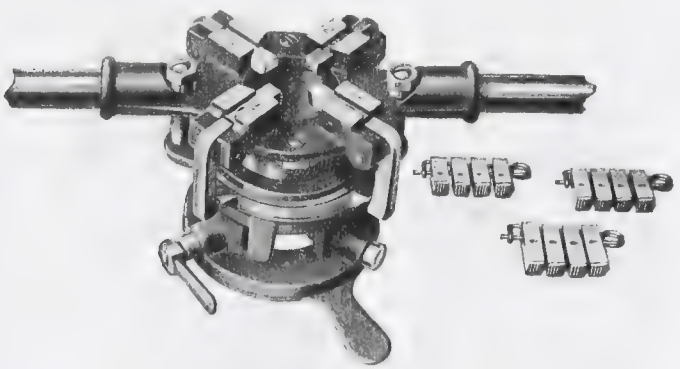
A 3-jawed universal chuck guide is provided on this tool and after the jaws are tightened against the pipe, one turn of a grip screw working inside of the chuck tightens the chuck so that it cannot slip. The jaws open wide enough to take in a coupling of the largest pipe size that comes within the range of this tool. Adjustment may be made for cutting shallow or deep threads, such adjustment being easily made by changing the setting of the lock nut and adjusting rods that project through the head of the threader.

The lead nut is made of three segments, which clean themselves, and no dirt or chips can gather on the lead screw. Both the lead screw and nut are replaceable without requiring the tool to be returned to the factory.

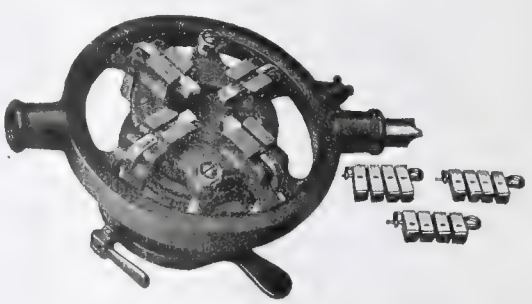
The threader is regularly furnished with one set of narrow chasers for each pipe size, Briggs standard right-hand threads being furnished, unless otherwise specified. Chasers for cutting British (Whitworth) standard threads may be furnished to order.

Ratchet Receder

To provide for the performance of pipe threading operations in trenches or near to walls, and other places where the amount of space is limited, a ratchet receding pipe threader has been placed upon the market by the Greenfield Tap & Die Corporation. In its general arrangement, this tool is similar to the regular receding threader, which has just been described. The ratchet mechanism represents the only change and it is incorporated right into the die stock instead of being made an attachment. The head is so designed that the pulling strain of the handles comes directly back of and in line with the chasers, thus minimizing the pull and preventing danger of trouble caused by twisting strains. The threader is made with two-handle lugs, and two handles are furnished with the tool. When it is to be used with the ratchet mechanism, one of these handles is taken off and the tool will then swing in a 14-inch circle, but it is equally feasible to disengage the ratchet, screw the second handle into place in its lug, and use this tool, just as the regular receding pipe threader is operated.



GREENFIELD RECEDING PIPE THREADER.



RATCHET RECEDING PIPE THREADER.

AN AUXILIARY HOIST FOR TRAVELING CRANES

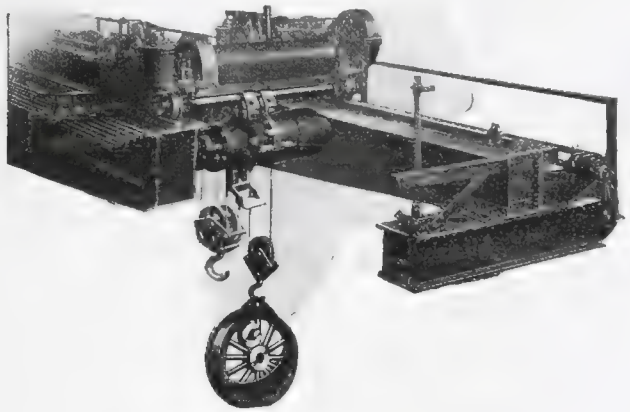
A simple and practical auxiliary hoist for attaching to any standard overhead electric traveling crane, as shown by the illustration, has recently been developed by the N. B. Payne & Co., 25 Church street, New York City.

The crane lends itself to quick and easy attachment, as it is claimed by the makers that it can be attached "the day it arrives."

The hoist does not take up any more room overhead, does not require an extra trolley, does not shorten the travel of the trolley on the bridge, nor does it interfere with the accessibility of the main hoist. It is plain that these ad-

vantages involve a considerable money saving.

It is pointed out by the manufacturers that the average traveling crane in a day's work usually handles a far greater number of light loads than heavy loads, and this is an important point worthy of investigation Since cranes for lifting heavy loads are slow-moving, their use results in a serious loss of time if they also handle the light loads. Thus a 20-ton crane, direct-current, with a hoisting speed of 12 feet per minute per load, will handle a three-ton load at but slightly greater speed. But with the auxiliary hoist a light load of, say, three tons, may be handled at the very much higher speed—2 to 10 times as fast as the speed of the main crane.



AUXILIARY HOIST FOR CRANES.

Attachment of this auxiliary also effects an important power saving. Very often the hook and block of the main crane together weigh more than some loads frequently handled. The auxiliary hook and block being much lighter, it is evident that the power saving in a year's time becomes a worth-while item. The labor saving with the auxiliary hoist is another important item, especially when a gang of men must wait for a small piece being slowly moved by a large crane. This is a vexing circumstance with which many foremen are well familiar. The auxiliary eliminates this labor loss.

Ordinarily from 1 to 5 tons standard auxiliary hoists are supplied by the makers to meet the usual requirements. Larger special sizes, however, are furnished where specified.

Also, by the application of this auxiliary attachment any standard single hoist electric traveling crane may be equipped with two lines for drop bucket service. The control may be arranged from cage, floor or pulpit to suit the crane to which it is applied. It is stated that this auxiliary can be attached by the purchaser, but to assist the manufacturers such information as this should be given: kind of service; make and type of crane; span; lift, alternating or direct-current motors; voltage; phases; cycles; cage, floor or pulpit control; speed in feet per minute of main hoist at full-load and no-load; approximate weight of average crane load; number of lifts per day; maximum capacity of auxiliary hoist desired; speed in feed per minute desired at full load.

It is evident that this device will prove of much value to present owners of old slow cranes.

THE "REED JUNIOR"—HALF-INCH MICROMETER

Answering the call for a sturdier half-inch micrometer caliper than has been on the market, Reed Small Tool Works, Cherry street, Worcester, Mass., has developed a tool which is claimed to satisfy all requirements.



THE REED JUNIOR HALF-INCH MICROMETER.

In presenting "Reed Junior," the manufacturers state that "Junior" is a chip of the old block—that all the good qualities found in their larger sized micrometers are reproduced in the half inch size.

The simple, but rugged construction, assures long life for everyday use. Equipped with a solid anvil and two-part thimble instantaneous adjustment is afforded, this being a special feature in the Reed micrometer. The diameter of spindle, barrel and thimble remains the same as that of the one-inch to six-inch micrometer, but these parts have been reduced in length. Small enough to slip into the vest pocket, the Reed Junior is still large enough to be easily operated by one hand, the deep throat allowing room through which to pass the little finger in grasping the frame.

A natural thumb and finger grip is furnished by the concaved web of the drop forged steel frame and the possibility of a firm grip, especially when being handled under oil will make the "one-handed half-inch micrometer" an extremely popular tool.

The dull nickel finish of the frame obviates the glare found in the highly polished frames, while the clean-cut graduations and figures of generous size will relieve the eye strain of the accurate workman.

This micrometer will be furnished in both English and Metric systems and with lock nut and ratchet stop, if desired.

To Tunnel St. Lawrence. — The Chambre de Commerce of Montreal, at a recent meeting, gave a unanimous approval to a project for tunneling the St. Lawrence River, and the building of a central union station in Montreal. As outlined at the meetig, the idea was that the tunnel should reach the heart of the business centre of the city.

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The National Railway

MANY of the railway officials of private roads in Canada, including Lord Shaughnessy and President Beatty, of the C. P. R., are quite outspoken in giving their opinions regarding the chances of success or failure attending the efforts by the Dominion Government in operating the C. P. R. and C. N. R. Their big point is that the Government cannot give or get the services that the privately-operated road can.

This country, now that the G. T. R. and C. N. R. have practically been placed on its doorstep, has 25,000 miles of road to care for and operate. It cannot even be claimed that in taking these over the country has come into possession of property that has been financially successful heretofore. Had it been a financial success it would never have passed into the hands of the Government. We have a peculiar way of doing business, in that only the lame ducks are handed over to the Government under the guise of public ownership.

As a matter of fact the Dominion Government has a stiff proposition. It is doubtful if the Ottawa authorities can take the property they now have on their hands and make it a financial success. They are handicapped in the first place because in the past the Government has not conducted its other departments on a business basis. The most recent of these to be hauled to the surface and dangled before the public gaze has been the Printing Bureau. The conditions there were such that, had they been applied to any other business that had to pay its way or sink, the sinking would have now been a matter of rather ancient history.

Have the people, who, after all are the owners of the Government roads, any guarantee that principles more sane and more thorough will be applied to the management of the railroads than have for years been permitted at the Printing Bureau?

There are so many millions at stake that the question of management and control becomes one of colossal importance. If there are the usual number of political tinkers running the affairs of the National Railways, Canada can get ready to face an annual deficit that will be as a millstone hanged to her neck, and expect to pay transportation rates away over and above those that were previously paid to the companies.

The Government of this country does not occupy an enviable position in taking over 25,000 miles of railroad. Governments have not shown themselves adepts at business, and were the reverse to prove the case in regard to the railroads Canada would be in for an agreeable surprise.

The Overhead Expenses

EVER hear a man say that there was nothing in a motor car to justify the price that is charged for them? Perhaps you have said something like that yourself. You have given the car the once-over, and in a hazy sort of way have set down the things, mentally, that go to make up the car.

You have counted the four wheels, the chassis, the engine, and so on. Being of a mechanical turn of mind you have figured out how the engine, the differentials, etc., could be turned out in quantities and rushed through quickly, and you have satisfied yourself that the price charged for the car couldn't be found there from the standpoint of mechanics.

But wait. One Canadian firm has plans out now for making cars. Long before they made any announcement they had their men all over the country asking questions, finding out all they could about the demand, the cost, the marketing conditions, etc. Then comes the period of buying the equipment, and remember the equipment market is still based on war prices. After a long list of tools has been bought and considerable tool-room equipment, the next call is for the fitting up of another department entirely for the making of the differentials to be used in the cars. This is going to call for an outlay of about $140,000 or even more.

And after all this is done there will be the material, the assembling, building, testing, finishing, etc. It will be months yet before the company get one cent of return in the way of purchase money from the buyers of the car. Their car, after being made, must be marketed. This means a selling organization, an advertising campaign, and an expense account of very large proportions.

It means that for months and months the firm undertaking to put the car on the market must continue to be simply a purchasing and a spending organization. To all intents and purposes the office of the receiving teller has been closed. The promoters of the scheme have simply to go ahead and spend.

The buying public sees nothing of this. They see nothing but the finished article, and at once reckon what it is worth on the basis of time and material on actual production.

The same thing is true of many things that people buy for various purposes. They have called for tremendous outlays, long months of lavish spending, and very often the ability of the promotors to stand this period is sorely taxed.

So don't forget that the months of preparation, of costly unproductive effort, help to pile up against every automobile a goodly amount of overhead charges that cannot be dodged, and all of which tend to increase the selling price without improving the car.

DOWN South a broker won a swimming match against all comers. Constant contact from dealing in watered stock keeps him in shape.

HERE'S a new flivver joke. If one flivver passed another on the road, what time would it be? Quite easy. Simply tin past tin.

MANY a brave man who has seen action at the front now fears the action his wife expects in the back yard when she flops the parlor carpet over the line fence.

SOME of the teachers who were in conference in Toronto a few days ago almost fainted when some keen mind unearthed the information that barbers on an average were making more money than teachers. The teachers should not worry. When we all turn Bolshevik the barbers will be so shy of business that the chin-scrapers will occupy a lowly place in the land.

The Graded Certificate

ONE of the bills which was given its third reading by the Ontario Legislature provided for the grading of certificates for engineers and brings this Province into line with other Canadian Provinces with the exception of New Brunswick and Prince Edward Island. With these exceptions graded certificates have practically become a reality from coast to coast, and action in conformity with that of the Ontario Legislature may shortly be expected in New Brunswick.

It is expected that the rating of certificates and the examinations held under the Act will be of such nature as to conform to those in other Provinces, and in this manner make the certificates issued by the various Provinces interchangeable.

Certain plants are exempted and to the operation of these graded certificates are not essential. Power plants having a capacity of less than 50 boiler horsepower, as determined by definition in the Act, are exempt together with heating plants operating at twenty pounds pressure or under. Locomotives and steamships are also exempted and boilers for agricultural purposes; threshing engines, etc., also do not come under the provisions of the Act. Only those hoists which are used at mines or quarries are exempted, all other hoists being subject to the operation of the Act. This portion of the Act has been re-enacted from the former one and no change has been made.

The most important feature of the Act is that portion making provision for the grading of certificates and for the recording of changes made from time to time in the positions held by engineers.

It is probable that four classes of certificates will be issued. The fourth class certificate will embrace all firemen having six months' experience, night watchmen and water tenders. The holders of this grade of certificate will be required to know how to operate a boiler in a safe manner.

The third class certificate will be the lowest engineer's certificate and will be required of those operating steam plants of 50 boiler horsepower or over, up to the lower limit of the next higher class.

The second class certificate will be required of those having the operation of plants of greater capacity in their care.

The first class certificate will be the highest grade and will be obtained only by examination. This examination will necessarily be of a highly technical and practical nature.

Present holders of certificates will be divided into two classes: second and third, the standing to be set by the board and the first class certificate will be obtained only by means of examination.

It will not be necessary for engineers at present operating a plant to obtain the certificate necessary for its operation under the new law, so long as he continues to remain in his present position, but if he changes to a plant having a higher rating the Act will necessitate his having the proper certificate for its operation, time being given for his preparation for examination.

In the furtherance of this legislation all power plants coming under the Act will be registered and the boiler horsepower of all plants in the Province will be obtained. Registration certificates will be issued and these certificates will be permanent unless alterations are made, in which case a re-registration will be necessary. This portion of the Act is of interest to the plant owner as it concerns him alone and does not affect the engineer except in so far as it permits the board to keep track of the plant capacities and thus to determine the grade of certificate necessary for its operation.

Do You Know This Chap?

HE was a pillar in the church, at least he said he was, his Sunday face it was a sight from eyebrows down to jaws. He had the holy look down fine, it was a treat to see him come to kirk on Sabbath day with children one, two, three.

He 'tended all the meetin's with an air of joy and grace, and never lost a single chance to open up his face.

His prayer was always six feet long, 'twas always just the same, and folks that didn't come at all knew just what he was sayin'. At every business session, too, he bobbed up in their midst, and criticized the whole machine with thumpin's of his fist.

He always had a lot to say 'bout the financial end, as though he thought the thing should pay a monthly dividend.

At every social thing they had, our friend was right on deck; of cake and all such things, he must have ate a peck. One might have thought that this here man was just one model saint, an echo of the good old school, so pompous, yet so quaint.

We saw him, though, one Sabbath morn, 'tis sad to contemplate—he sorted out his coin and got a nickel for the plate.—ARK.

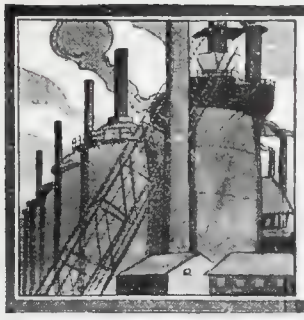
IF THE people of this country were not crammed and jammed to the neck with downright grasping selfishness, chances are that there would not be so many increases and jumps in the prices of food and clothing.

THE British Admiralty is advertising in some of the papers that it has a number of German submarines for sale cheap, the only stipulation being that they shall be broken up. There are quite a heap of folks who would with pleasure tackle the breaking-up job.

AN agitation is on in England, and it promises to gain strength, the object of which is that husbands shall pay wages to their wives. But in the case of the well-trained man, who simply comes home and tosses his pay envelope into his wife's apron, what is going to happen? Will some courageous individual arise and suggest that the husbands shall be allowed a certain amount as salary?



Hungerford, in Pittsburgh "Sun."
The Dime Novel



MARKET DEVELOPMENTS



Several of the Old Country Prices Still Too High

Dealers Figure They Are at Least 25 Per Cent. Too Much in Advance of Competitors—Nothing Moving Yet in the Way of Structurals, But Many New Machines Are Sold

THE sale of new machinery increases. Several of the larger dealers have stated that during the last month there has been more new material disposed of than in any period since the signing of the armistice. For some time past the bulk of the trade moving has been in disposing of used machinery, which while making things busy for the warehouses, did nothing for the builders of machinery. Automobile plants and the National as well as C.P.R. are in the market with fairly good lists.

Nothing moves yet in the way of structurals, and that section of the steel business remains very quiet. Until there is evidence of some developments there the chances are that several other lines will remain inactive. For instance, when structurals are brisk and building is booming there is a big demand for steel plate for boilers, safes, and a dozen other things. Warehouses admit that, although they are buying quite a fair tonnage now, they always specify prompt delivery, and they have a pretty fair idea as to where they are going to dispose of their produce. It may be that they have every confidence that present prices are going to remain for some time, but their actions do not point in that direction.

Dealers in scrap metal are simply marking time. In fact, at no time since the ending of hostilities have they had a chance to start a movement that would carry out much of their stock. Dealers are not anxious to sell at present levels, holding that there must be an improvement very shortly. On the other hand few of them want it to be known that they are in the market, as they are pretty well stocked up. Steel mills and foundries are not buying, as most of them have their yards well filled.

Old Country steel and iron materials will have to show substantial reductions before they can again find a place in the Canadian market, as at the present time many of these lines are at least twenty per cent. too high. Some reports have it conditions are only temporary, as Old Country plants are still in many cases on a war basis. However that may be, it is a fact that for present purposes their figures are too high.

THE CARTERS' STRIKE DID NOT HELP THE BUSINESS IN MONTREAL

Special to CANADIAN MACHINERY

MONTREAL, May 1.—During the past week business in this district was somewhat disorganized owing to the carters' strike, but fortunately this has now been settled and merchants and shippers are hopeful of resuming activities on a normal basis. The water-front has again returned to its busy season and prospects look good for the open period of navigation. The return to ordinary industrial activity is still unpronounced, but every report seems to point to increased expansion in the near future. The entire situation is one that is difficult to define with any degree of accuracy as the tendency to do business other than for immediate needs is of a reluctant character. The reason for this is the unsettled state of peace developments and the delays that are experienced in the adjustment of steel conditions. Dealers here are not overcrowded with orders, but the volume is sufficient to maintain the spirit of optimism that has featured the operations of the past four months. Little increase is noticed in machine-tool business, but activity is of a steady character.

The metal situation is still without feature, and general trading is comparatively light with quotations unchanged but continued firm. Old material is still listless and continues to be influenced by the unsettled conditions of the general trade situation.

Buyers Show Waiting Attitude

Despite the fact that actual sales of new machine tools are of a light character the general inquiry would indicate that buying may develop at any time, the present reluctance being due largely to the uncertainty of the times and the negotiations that are still on respecting the method of disposal of those tools now owned or controlled by the American Government. While the bulk of this equipment is tied up in American plants the situation is one that affects the trade here, inasmuch as many of these tools will be absorbed by Canadian manufacturers as soon as their release is possible. Many hundreds of new tools of various standard types are likewise tied up in Canadian plants as a result of the stoppage of American shell contracts.

When a definite ruling has been made as regards their resale, it is anticipated that plenty of buyers will appear in the market. Until the bulk of this "war" machinery is finally disposed of normal operations are out of the question. Dealers' reports indicate a fair volume of supply business with prices showing little tendency to lower levels.

Local Activity Only

Interest in old materials during the week is virtually confined to the possible developments arising out of current negotiations between the steel mills and the American Government regarding an agreeable adjustment of steel prices for domestic operations. The market has, to some extent, been of an open character, but competition has not been such as to create a serious cutting of prices. Scrap sales generally are contingent to general activity and with this of a very uncertain nature, the movement of old material is restricted to actual needs for immediate requirements. Local trading is light but steady. Some declines are noted in the iron list; heavy melting steel, with a drop of 50 cents a ton, is quoted at $9.50 per ton. Machine cast-iron and wrought iron pipe are both lower, the quotations of $17 and $8 representing a decline of $1 per ton.

ARE BUYING MORE NEW MACHINERY NOW

Dealers Find Trade Satisfactory In Amount of New Material That Is Called For

ORONTO.—Explaining why more business is not coming in has grown to be the chief pastime of several firms and individuals. They used to blame the war prices, the coming of peace, the fixed price list of steel and iron. In fact if there is anything that has not been blamed for the apparent holding up of freer buying we would be pleased to hear of it at once, so that it might be trotted out and the thing made unanimous.

Accept Steel Prices

The Canadian trade appears to have accepted it for granted that the prices named in the last schedule for steel are going to stand for some time. A nice volume of business is moving on this supposition. At the same time it cannot be urged that there is the freedom in buying that would be caused were there more confidence that the prices would not be lowered for some time to come. Even the warehouses, although buying fairly heavily, are not going into the market in the way in which they did in pre-war days. They make their orders up and bind the mills down to deliver in a specified time, usually not more than three weeks away. There are none of the big, old-time orders going to the mills which they could fill at their leisure, and which could always be counted upon to keep the plant running close enough to capacity to keep production costs within proper limits.

It is a fact, though, that the bridge and structural end of the steel business is just where it was when the war stopped. Nothing is moving. This is probably due to the fact that the building trade is not brisk. Many lines are tied up with this. For instance the building of safes and boilers for large office and apartment buildings used to call for a large tonnage of steel plate, but there is nothing being ordered in this line at present, and there are no indications of an improvement in the immediate future. Then, again, people talk of peace not being fully established, about the chances for the Western crops, and a hundred and one things. In fact a number of firms are making their chief indoor pastime hunting up reasons for not coming into the market as good sized purchasers, instead of following along with the hand-to-mouth policy.

The Old Country Material

The settling down to peace lines is bringing several things to light, and one of them is that Old Country iron and steel is going to have a stiff fight to win back the market that has been lost during the war by the inability of the Old Country producers to get their material on the market here. Before the war there was certain lines of hand-made iron chain, bars, etc., that were in great demand. They were well-known British lines. In fact some of the railroads used to give three options as to what irons could be used in their work, and all three of them were Old Country lines. Now, however, the price is at least 25 per cent. against the British goods. It may be that the conditions that are causing these high prices in the Old Land are more or less temporary, and that with the return of more normal conditions they will be able to come in here "at a price," but for the present they are too high to get much of the trade.

Buying New Machinery

Although there are not a large number of concerns in the market now for new machinery, those that are buying are taking on large amounts. Dealers report that there has been more new machinery bought during the past months than for any two months since the signing of the armistice. The feeling will not down, though, that prices are too high. Buyers will pay a reasonable advance on pre-war rates, as they can see and understand why the price should be higher, but when it comes to selling a machine now for around $1,000 that used to go on the market for between three and four hundred, they begin to find fault, and the result is that many of them look for used equipment or else stay out of the market entirely. Makers of machine tools fear labor difficulties, it is said, and must maintain a safe margin on which to work.

But prices show little inclination to step down. In fact they refuse to budge, although in a few isolated cases some lines have receded about ten or fifteen per cent., but are still away high to the levels that were maintained before the coming of the war.

A Dull Scrap Market

"Things are no worse or no better than they have been for some weeks past." That is the way the largest dealers in the district size up the situation. Dealers are taking on such material as comes in at the prices which are published elsewhere in this paper, but they are not keen to buy. They have to take on quantities at times just to let the trade see that they are in the market for material, and sometimes in order to protect their name and credit. As a general thing they do not want to buy, even at the comparatively low figures now quoted. Some of the smaller dealers still have in mind the high figures they were receiving for their material during the years of the war, while the ultimate user has in mind the much smaller figure at which he may have to sell the articles for which he would buy scrap material. Between these two points there is a big gap, and it has not been bridged.

The steel mills and the foundries are not buying anything to speak of. In many cases they are pretty well filled up, and added to that the rate at which they are consuming material just now is much smaller than it was during the period of the war.

Prices have not been changed at all during the last two weeks.

POINTS IN WEEK'S MARKETING NOTES

There have been no changes made this week in Toronto prices for steel, iron or scrap metal, and the general opinion is that prices as slated now will remain for some time.

—

Dealers report that they have sold more new machinery during the last month than for any similar or longer period since the signing of the armistice.

—

Orders that are sent in from this district to the steel mills are usually accompanied by a condition that shipment be made inside of two or three weeks. Although buying is fairly brisk, it is all conducted on the hand-to-mouth order.

—

Old Country steel and iron goods are finding it hard to get re-established in the Canadian market, owing to the fact that their prices have increased more than those of competing countries for the Canadian market. On iron, British goods are still 25 per cent. too high.

—

Pittsburgh reports that current bookings are not sufficient to account for anything over thirty per cent. of the capacity of the steel mills, but old orders bring the total up to around 60 per cent.

MAY DISCUSS THE PRICE OF MACHINES

Reductions in Machine Tools Have Not Been General, Nor Would it Help Selling

Special to CANADIAN MACHINERY

NEW YORK, May 1.—Nothing has occurred to change the machine-tool situation, which is largely one of waiting on the part of prospective buyers. Machine-tool sellers are assiduously following up their inquiries, but comparatively little business is being placed. The whole business situation is quiescent, and it is not expected that machine-tool buying will be greatly stimulated until there is a general business improvement. These observations apply more particularly to conditions in the East than in the central West, for there is a moderate amount of new buying being done, principally by automobile and tractor interests, though at Chicago a variety of industries have come into the market, such, for example, as manufacturers of washing machines, wrapping, candy and baking machinery.

There are no developments in the price situation. The recently reported reduction in the prices of engine lathes has not brought forth reductions on any other lines. The opinion of some in the machinery trade is that no trade will be gained by price reductions, and it is predicted that many manufacturers will stand pat on present prices, at least until July 1. There will, however, be a discussion of costs of production at the spring convention of the National Machine Tool Builders' Association at the Hotel Traymore, Atlantic City, N.J., on May 12 and 13, and further reductions may follow that meeting. Many machine-tool builders believe that when prospective buyers actually need the tools they will buy them regardless of price.

Further conferences are to be held between the machine-tool dealers and representatives of the War Department to agree upon a plan for the disposal of Government second-hand machine tools. As reported last week the machine-tool dealers are standing firm for a 15 per cent. commission instead of the 7½ per cent. offered by the Government authorities.

Cable advices have been received from England that the embargo on the importation of machine tools has been lifted. This embargo has not operated seriously against some of the better known makes of American machine tools, which have been admitted quite freely under blanket permits. However, some of the lesser known tools have been excluded almost absolutely.

STEEL MILLS ARE NOT GETTING BUSINESS TO COME NEAR CAPACITY

Special to CANADIAN MACHINERY

PITTSBURGH, Pa., May 1.—The stagnation in the pig iron, unfinished steel and finished steel markets has become more pronounced and at the same time it has become more remarkable, because with the opening of spring and the progress towards the peace settlement one would certainly expect greater activity.

Yet the fact is that merchant furnaces continue to blow out, one after another, and steel mill operations continually decrease, having now dropped to about 60 per cent. of capacity, and with at least half the production depending upon old orders, current bookings representing 30 per cent. or less of capacity.

These are conditions that might easily have been expected to obtain immediately after the cessation of hostilities, when war work must have been suspended very largely, and when time had not been afforded for consumers of iron and steel to get busy on peace work. Yet the showing has been that even three months after the signing of the armistice, in January, the average rate of steel production was 87 per cent. of capacity, production being now about 60 per cent. with prospects that if conditions do not change a rate of less than 50 per cent. will be reached in another 30 days.

The Price Muddle

There is disposition in many quarters to blame the lethargy in the market on the muddle made in Washington of the attempt to set prices. The program as originally announced seemed to call for price deflation in all lines, so that buyers could go ahead, but the Industrial Board shifted its ground and referred to the operation as being one of "price stabilization." Certain reductions, not as large as had been expected in many quarters, were arranged, and then the new prices are announced as being minimum for the remainder of the year.

It is quite unsafe to accept at par explanations American business men give for dullness in business, as has been proved, by subsequent events, upon many occasions. For instance, in say ten years before the war, there were several protracted cases before the Interstate Commerce Commission, the railroads desiring freight rate advances, and if business chanced to be always dull at the time, everybody said the trouble was the Interstate Commerce Commission: if they would only grant that rate advance business would boom. Men even set dates, and said that unless the decision should be reached by such a time it would do no good anyhow. When decisions were made, however, these same men scarcely took time to read the details of them, and business went on just as before. At other times it was the tariff that was holding business back. It is well therefore not to put too much stock in the talk these days that the muddle at Washington is responsible for dull business. The observation will be seen to be the more pertinent when it is noted that all the talk and criticism is levelled against the Railroad Administration, particularly Walker D. Hines, Director-General of Railroads, because he refused to endorse the Industrial Board steel prices and place orders at them. He refused to "co-operate." Practically nothing is said about the Navy Department, which did precisely the same thing, and worse, indeed, for the Navy Department formally threw out the bids for 20,000 tons of steel, stating that they were unacceptable because not competitive. The Director-General had not even asked for bids. Then Chairman Hurley, of the Shipping Board, announced that additional contracts for 2,000,000 tons deadweight of vessels are about to be cancelled because the war is over and the board can't go ahead at "war time prices." If all this talk were fair and sensible there would be equal criticism of all three departments, but the Railroad Administration gets it all. The explanation is not a matter of business at all, but of psychology. The Railroad Administration, the Navy Department and the Shipping Board all helped to win the war, and all are entitled to equal credit because they all tried to do their best. There was a big difference, however, in the psychological effect. The United States Navy, for various reasons, one of which is extremely obvious, stayed out of the United States, The Shipping Board sent its ships out of the United States. The railroads, however, operated all over the ground and everybody came in contact with them, experiencing much dissatisfaction in that contact. So Director-General Hines gets all the blame, and nothing is said about Secretary Daniels or Chairman Hurley.

"Open Market" Discussion

The trade talk is largely of "open market. There has been an "open market," so-called, in pig iron for several weeks, for for merchant furnaces lost little time in renouncing allegiance to the Industrial Board price schedule, being much dissatisfied with it because it reduced steel so much less, proportionately, than pig iron, and also because they held that for real activity business would have to get back to usual principles, which means an open market in pig iron, as always before the war, each district making its own prices under competitive conditions. However, so far as Western Pennsylvania and Ohio are concerned there has been practically no cutting below the regulation prices, which became effective March 21. The explanation is that there has been no inquiry large enough to make it worth while. A large sales office in this town reports its largest sales in the past week to have been in 100-ton lots, two such sales, other sales being of carloads. A large producer of basic and Bessemer pig iron had nothing larger to work on than an inquiry for 200 tons of high silicon Bessemer, which it sold, getting about the pre-war premium for the silicon, above the standard Bessemer price, instead of the fancy silicon differential prevailing during the war.

In steel products it is a matter of defining terms, whether or not there is an "open market." Many observers claim there is one, that many mills would cut the "official" prices if there were a good order to be secured thereby. But if one regards as "open market" one that really operates as such, sales being made at competitive prices, under the official prices, there is no such thing yet, because no such sales are being made. The selling, what little there is, involves the regular official prices, with perhaps here and there a little exception.

The question is how this situation will be resolved. If buyers, and particularly "investment" buyers, those that might engage in large construction projects, were to offer large orders and mention the prices at which they are willing to close, the steel producers would pro-

bably negotiate, but the buyer does not do this. Either he does nothing or he buys from hand to mouth, paying the price asked. If, furthermore, the steel producers were sanguine enough to believe that a large volume of business could be brought out by cutting prices and making a competitive market, they would doubtless do so. Judging by what occurred after the market was thrown open in February, 1919, after the famous "Gary dinner" movement, it requires about three months for the market to go through the racket and, having found its low point, begin an upward movement. The steel producers may like to have it thought that they seriously intend to hold present prices until buyers accept them and fill the mills with orders, but there is probably not a steel producer who really expects anything of the sort. All of them probably favor a break when the time becomes ripe, the question being when they will consider the time ripe. It may be in a week, or it may be in 3 months. Meanwhile there may be a particular advantage in holding steel prices firmly, to make the break the more impressive when it does come.

SCRAP IRON IS IN POOR SHAPE JUST NOW

Decided Tone of Weakness That It Is Almost Impossible to Shake Off

THE scrap iron market has again developed weakness, due to lack of demand. The reports from different United States points are as follows:

CHICAGO.—With the absence of trading prices have declined again. Delivery of the balance of former contracts is being found sufficient for the needs of consumers. What the railroads are offering is being taken up by dealers.

NEW YORK.—Prices generally are at last week's levels, though wrought pipe has declined a little. Outside of borings and turnings there is little demand. Most dealers are holding their stock rather than sell at present prices.

PHILADELPHIA. The market is weak in practically all grades. Heavy melting steel is quoted at $15 to $16 delivered. Blast furnace turnings are selling at $10 to $11 delivered.

PITTSBURGH.—While there is little business prices are holding fairly steady, It is believed that the mills are using up their stocks, and in view of the fact that prices are at a level that matches the intrinsic value, further drops are unlikely.

CLEVELAND.—With a very slack market, dealers are making no effort to get rid of accumulations, believing that a rise will be evident in the near future. Consumers have enough scrap on hand to carry them on for some time, and are not anxious to buy just now.

BUFFALO.—While there has not been much buying the market shows a good tone. There is a fair demand for borings and turnings, and some enquiry for heavy melting steel. The indications are for a good amount of business in the near future.

CINCINNATI.—There is very little enquiry and all grades of scrap are weak. Dealers do not profess much hope for the future. Steel turnings and cast borings are somewhat stronger.

ST. LOUIS.—The market here is on the decline. Steel dropped $1 a ton during the week. What business there is is confined to dealers.

BIRMINGHAM.—Dealers are hoping for a better market, and in view of this are trying to buy some of the scrap the Government is offering. Pipe makers are enquiring for cast iron scrap.

BUYING PIG IRON IS BEING DONE IN ONLY VERY SMALL QUANTITIES

BUYING in the smallest possible quantities, and a still further decrease in production, are the features of this week's markets. More stacks are being blown out in the eastern districts.

Following are reports from various centres:

PHILADELPHIA.—Judge Gary has stated that the price plan is dead, which statement has roused some interest in the market. There has been some improvement during the week, some thousands of tons having been sold for prompt shipment. Producers are making just enough iron to cover their contracts, piling not being practical at present costs.

NEW YORK.—There has been a little better demand for spot buying during the week, most dealers reporting the sale of a few hundred tons. Several more stacks have been blown out and others are expected to follow. Some small tonnages have been sold to Brazil, Argentine, Chile and China. Export to other countries is held up through high freights and other causes.

PITTSBURGH.—Production has been cut down to approximately 50 per cent. of normal in this district. Producers do not intend to pile iron. The new prices continue to be quoted, but it is thought that any large enquiry would bring a cut. At present enquiries are very sluggish. Two or three months of the reduced production would about even up the supply situation, as present stocks are high only in comparison with the small demand.

BUFFALO.—The view of furnace men here is pessimistic. Production is still on the downward path, several stacks being shut down. The feeling here is that artificial price fixing should be discontinued, and the market left to the ordinary laws of supply and demand.

CLEVELAND.—There is not much new business moving. Some makers have decided to adjust contracts to the new basis, as far as undelivered parts of the contracts are concerned. In one case a clause has been added that if prices go up in the open market, such addition shall be added to the $26.75 price, up to $31, the price which obtained before the reduction was made.

CHICAGO.—There is no alteration in the situation here since last week. There is little activity in the foundries, and production of pig iron is low. Contracts made with the idea of covering first half demands are likely to be sufficient for last half. The result is a stagnant market.

CINCINNATI. — The prospects of business here are very small pending some decisive action from Washington. Producers cannot see any way to lower prices with wages at their present level. There is a very light enquiry, consumers not being anxious to commit themselves far ahead.

BIRMINGHAM.—With stocks mounting in the furnace yards, further curtailment of production is anticipated. Sales are at a minimum and another stack is expected to go out shortly.

ST. LOUIS.—Lack of confidence in the market is shown by an almost complete cessation of business. Consumers are not getting orders, and in turn are not buying pig iron.

Economic Condition of the Chinese People

One of the Richest and Yet Most Undeveloped Markets and Nations in the World—Peculiar Customs Rulings—What the Canadian Manufacturers Ought to Know About the Business

By TRADE COMMISSIONER J. W. ROSS, Shanghai

WHILE China is a land of vast area and resources, with an enormous population, the consumption of foreign goods does not depend so much upon the desire of the people for many articles, as in their ability to pay for them. The purchasing power of the Chinese people is probably lower per capita than that of any other civilized nation. It is therefore necessary that their whole economic condition must be improved if the trade of the country is to greatly expand. It is all very well to say that China has vast resources; but resources are of little value if nothing is made of them. The great bulk of the Chinese people live off the soil, and all of their exports to foreign countries are in natural products—tea, silk, beans, seeds, hides, skins and furs—yet agriculture is conducted in

the most primitive manner. New seeds are never introduced, and machinery not at all employed. The cotton seed annually sown has so deteriorated that it only produces about half a crop of cotton, having fibres so short that it has a very limited sale abroad. It is not that the land is overpopulated so much as it is underproductive, due to faulty methods of cultivation. Nevertheless, too many people are trying to live off the soil for the reason that there is no other employment for their labor. Millions of the inhabitants should find employment in working the mines now undeveloped, and other millions should obtain their living through various industrial occupations badly needed throughout the Republic.

Primarily the most pressing needs of China are:—

(1) A great extension of railway lines to enable far distant and now inaccessible provinces to convey their products to the markets of the seaboard.

(2) Government support and instruction in agriculture. This is of prime necessity. In particular the tea, silk and cotton industries all require special attention; and in respect to the former, unless some means are employed to improve the methods of cultivation and curing of tea, the industry is threatened with total extinction.

(3) The extensive mineral wealth of the country needs to be developed, and this cannot be done without the assistance of foreign methods and foreign money.

(4) The establishment of industrial enterprises of every conceivable kind. This is probably the most difficult of all the problems, but without such industries China cannot hope to advance very far, or the conditions of the people to greatly improve.

In order to bring this about encouragement will need to be given to foreign capitalists to induce them to make investments in industrial enterprises in the country. The present existing anomalous and absurd export duty and inland transit tax, as well as duty upon raw material, will need to be removed, and the country generally reorganized on common-sense and business-like lines, instead of the haphazard manner in which it is being run at the present time.

Industrial Enterprises

If China is to advance at all it must be along industrial lines in order that the pressure upon the soil may be relieved. It has frequently been stated that the Chinese are inefficient, but this statement is not literally true. Their mistakes in the management of industrial enterprises are not those of inefficiency so much as want of knowledge. Practically none of the people have ever had any instruction in technical knowledge, and extremely few of those who go abroad to acquire this form of education ever make any practical use of what they have learned upon their return.

Any knowledge which the Chinese have obtained in engineering and in technical methods, excepting railway engineering, has been derived from working in mills and factories conducted under European management, and most of this has been merely picked up and has little or no scientific comprehension at the back of it. The Chinese are admirable in their management of small affairs, but in the conduct of large enterprises they are completely at sea. They have not the genius for organization and leave too much to badly paid assistants. They do not understand how to eliminate waste, or how to utilize by-products. Their industries are nearly always under-capitalized, and so advantage cannot be taken of purchasing raw materials when markets are favorable. The above must only be taken as applying in a general way. There are some occasional apparently successful industries, but they are so few as to be exceptions.

Spread over the central parts of China in almost every large town are to be seen large factories which are either completely closed down, or, when running at all, only work a few months in each year. In one place it will be a cotton mill; in another a silk filature; in another a brick works or glass factory, or a paper mill. The history of nearly all their failures is as follows: A company is formed with either insufficient capital or a building is erected far too large for the requirements of the business. The industry is frequently established in a district where sufficient raw material is not always available. Consequently the works are idle many months of the year. No provision is made in the prosperous years for depreciation of buildings and machinery. Capital is diverted from one industry to maintain some other of a different nature. This is not an exaggerated picture, but is common knowledge of all who have resided in China for any length of time. This state of affairs is entirely due to lack of knowledge of industrial methods and the economies of modern business.

Customs Tariff

The Chinese customs tariff, which has been fixed by treaty with the various powers, is a 5 per cent. ad valorem duty only, which is applied to imports and exports alike. The port of Shanghai is the chief point of entry of all foreign goods imported into China.

In addition to the import and export tariff duties, there is a wharfage dues surcharge of 2 per cent. of the duty paid, the amount thus received being divided between the International French Municipal Councils and the local Chinese officials by an arrangement made in 1899. This is purely a municipal tax, and as a measure of convenience is collected by the customs at the time the duty is paid.

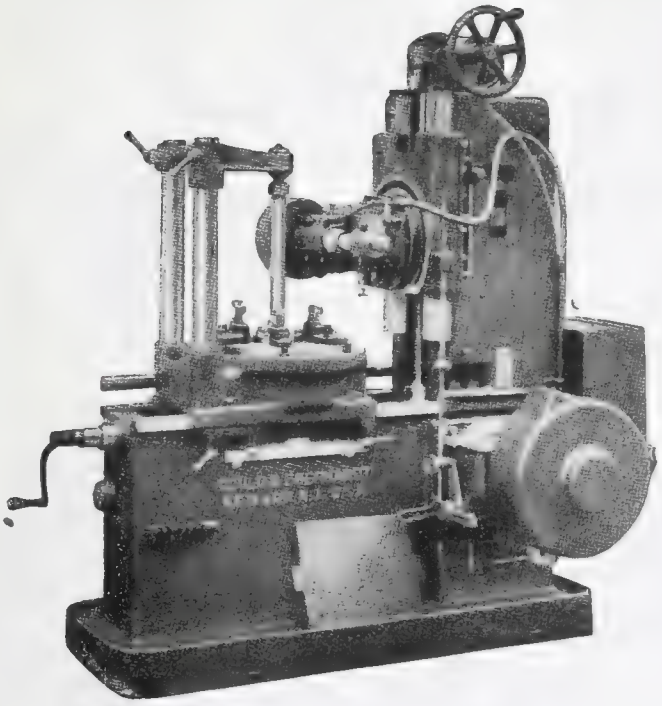
In addition, there is a conservancy tax of 3 per cent. of the duty paid, which is also collected in the same manner—and for the same reason—by the customs and remitted to the conservancy board of river improvement at the port of Shanghai.

The Chinese customs tarif is grotesque inasmuch as it penalizes China's overseas trade to the extent of 5 per cent. ad valorem on all exports. China maintains a most efficient and well-organized customs service of highly-paid foreign officials, whose whole time is spent in collecting a 5 per cent. ad valorem duty. The same organization could collect a duty of 10, 15 or 20 per cent. at the same expense. A large sum of money is urgently needed for harbor improvements at Shanghai, and the question has been asked: Where is the money to come from? What difficulty would there be in increasing the present small duty to 8 or 9 or even 10 per cent. and thus obtain the funds necessary? The increase would never be felt. Another peculiarity of the Chinese customs is a condition that probably does not exist in any other country. It is the tax on their own goods from one port to another within the country. Once a foreign-made article has been entered at a treaty port and the duty paid, it is free to be sent to any other treaty port without the payment of further dues; but a bale of Chinese cotton cloth manufactured in Shanghai, or any other article, if sent to Hankow, another port, must pay just as much duty as was paid by the imported article. In the matter of dues and duties there is no protection whatever or even encouragement given their manufacturers by the Chinese Government.

Trade Opportunities in China

Enough has been said to show the importance of China as a market for foreign manufactured goods. It is not so much the value of the trade to-day as the value that it must attain to with the coming years. If China is not advancing rapidly along new and modern ways, she is certainly not going back. There is evidence on every hand to show that advancement is being made, and the probabilities are that the progress from this time forward will be much more rapid than ever before; the present is therefore a most fitting time for those countries that are interested in the development of an overseas commerce, to make a study of this market and to familiarize themselves intimately with the country itself, its trade, resources, and people. In particular the actual position of China on the map and its relationship to other countries adjoining should be thoroughly understood. The location of the chief towns, as far as they are concerned in foreign trade, and the different rail and river routes, should be studied and made familiar; the products of the country and what China has to sell, as well as what it buys, should be known; for all such matters are of importance. A thorough knowledge of shipping routes, and shipping agents, and steamship lines, freight rates and tonnage, bills of lading, and

Continued on page 92



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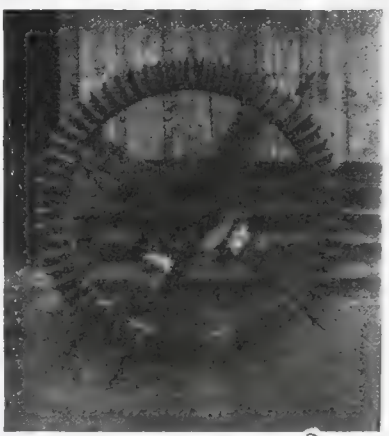
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8

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	
Bessemer, Pittsburgh	29 35
Basic, Valley furnace	25 75
Toronto price:—	
Silicon..2.25% to 2.75%	$32.75 to $35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bas, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	**11 00**
Tire steel	**5 50**
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	9 25
Chequered floor plate, ¼ in.	9 00
Staybolt iron	8 00
Bessemer rails, heavy, at mill	
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 30
F.O.B., Toronto Warehouse	
Small shapes	4 50
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

	Per 100 lbs C.L	L.C.L.
Pittsburgh to Following Points		
Montreal	29	39½
St. John, N.B.	47½	63
Halifax	49	64½
Toronto	23½	27½
Gueplh	23½	27½
London	23½	27½
Windsor	23½	27½
Winnipeg	81	106½

METALS

Lake copper	$19 00	$20 00
Electro copper	18 50	19 00
Castings, copper	17 25	19 00
Tin	60 00	58 00
Spelter	9 00	8 50
Lead	6 75	7 50
Antimony	8 00	8 50
Aluminum	35 00	40 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 5 00	$ 4 50
Plates, 3-16 in.	5 50	4 90

Price List No. 38

Standard Buttweld

Per 100 feet		
⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

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Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

OLD MATERIAL

Dealers' Buying Prices.

	Per 100 Pounds Montreal	Toronto
Copper, light	$10 50	$10 00
Copper, crucible	13 00	12 75
Copper, heavy	13 00	12 75
Copper wire	13 00	12 75
No. 1 machine composition	10 00	12 00
New brass cuttings	8 00	9 00
Red brass turnings	8 00	8 50
Yellow brass turnings	6 00	6 00
Light brass	5 00	5 00
Medium brass	7 00	6 00
Scrap zinc	4 00	5 00
Heavy lead	3-4	4 00
Tea lead	2-3	3 00
Aluminum	15 00	12 00
	Per Ton	
Heavy melting steel	9 50	9 00
Shell turnings	6 00	6 00
Boiler plate	10 00	8 00
Axles (wrought iron)	20 00	15 00
Rails	15 00	11 00
Malleable scrap	15 00	12 00
No. 1 machine cast iron	17 00	14 00
Pipe wrought	8 00	5 00
Car wheels	20-22	18 00
Steel axles	22 00	20 00
Mach. shop turnings	5 00	5 00
Stove plate	12 00	10 00
Cast boring	8 00	8 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	45
Elevator bolts	25
Machine bolts, 7-16 and over	25
Machine bolts, ⅜ and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd brass	net
Nuts, square blank	add $0 75
Nuts, square, tapped	add 1 00
Nuts, hex., blank	add 1 00
Nuts, hex., tapped	add 1 25
Copper rivets and burrs, list plus	15
Burrs only, list plus	40
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, flat, bright	75
Wood screws, O. & R., bright	70
Wood screws, flat, brass	40
Wood screws, O. & R., brass	5
Wood screws, flat, bronze	30
Wood screws, O. & R., bronze	27½

MILLED PRODUCTS

	Per Cent
Set screws	25
Sq. and Hex. Head Cap Screws	20
Rd. and Fil. Head Cap Screws	net
Flat But. Hd. Cap Screws	plue net
Fin. and Semi-fin. nuts up to 1 in.	25
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	20
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	plus 10
Studs	net
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	list plus 20
Collar screws	list plus 30, 10
Thumb screws	20
Thumb nuts	65
Patch bolts	add 40, 10
Cold pressed nuts to 1½ in.	add $4 50
Cold pressed nuts over 1½ in.	add 7 00

BILLETS

	Per Gross Ton
Bessemer billets	$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.
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NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

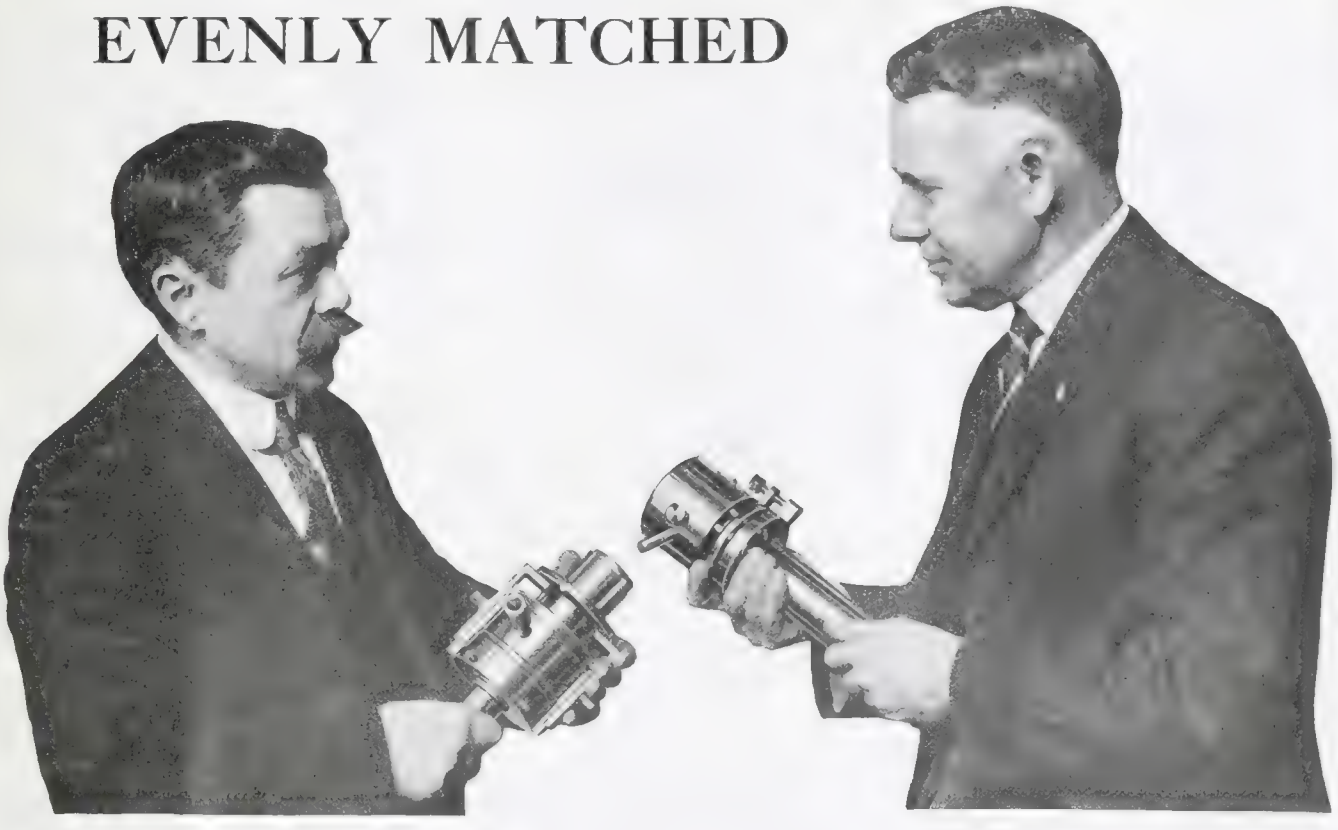
ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

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Canadian Agents: Williams & Wilson, Limited, Montreal; The A. R. Williams Machinery Co., Limited, Toronto, Winnipeg and St. John, N.B.

MISCELLANEOUS

Solder, strictly	0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls.,gal.	1 10
Linseed oil, raw, single bbls.	1 70
Linseed oil, boiled, single bbls.	1 73
Plaster of Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	list plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

	Per Cent.
S.S. drills, wire sizes up to 52	35
S.S. drills, wire sizes, No. 53 to 80	40
Standard drills to 1½ in.	40
Standard drills, over 1½ in.	40
3-fluted drills, plus	10
Jobbers' and letter sizes	40
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	net
Drills and countersinks	list plus 40
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	75
High speed cutters, list plus	40

COLD ROLLED SHAFTING

At mill	list plus 5%
At warehouse	list plus 25%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 00
Sheets, black, No. 10	5 15	5 45
Canada plates, dull, 52 sheets	8 50	8 00
Can. plates, all bright	8 50	9 00
Apollo brand, 10¾ oz. galvanized		
Queen's Head,28 B.W.G.		
Fleur-de-Lis, 28 B.W.G.		
Gorbal's Best, No. 28		
Colborne Crown, No. 28		
Premier, No. 28 U.S.		7 95
Premier, 10¾ oz.		8 25
Zinc sheets	20 00	20 00

PROOF COIL CHAIN B

¼ in., $14.35; 5-16 in., $13.85; ⅜ in., $13.50; 7-16 in., $12.90; ½ in., $13.20; $13.00; ⅞ in., $12.90; 1 inch, $12.65; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B. ⅛ in., $13.00; 3-16 in., $12.50; ¼ in., $11.75; 5-16 in., $11.40; ⅜ in., $11.00; 7-16 in., $10.60; ½ in., $10.40; ⅝ in., $10.00; ¾ in., $9.90.

Prices per 100 lbs.

FILES AND RASPS.

	Per cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$25 00	$.....
1¼ in.	27 00	
1½ in.	28 00	26 00
1¾ in.	30 00	26 00
2 in.	30 00	26 00
2¼ in.	33 00	28 00
2½ in.	40 00	32 00
3 in.	46 00	38 00
3¼ in.		45 00
3½ in.	56 00	42 00
4 in.	70 00	54 00

Prices per 100 ft., Montreal and Toronto les 10.

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	19½
Palacine	22½
Machine oil, per gal.	27½
Black oil, per gal.	16
Cylinder oil, Capital	52
Cylinder oil, Acme	39½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	10¼

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	3 25
Polishing wheels, bull-neck	2 00
Emery in kegs, American	07
Pumice, ground	3½ to 05
Emery glue	28 to 30
Tripoli composition	06 to 09
Crocus composition	08 to 10
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.06

BRASS

Brass rods, base ½ in. to 1 in. rod	0 38
Brass sheets, 24 gauge and heavier, base	0 43

WASTE

Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X press	14
X L C R	17		

Colored.

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing.

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers.

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard ... 10% Best grades .. 15%

ANODES.

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 25	$11 50
Sheets, 3½ lbs. sq. ft.	10 00	11 00
Sheets, 4 to 6 lbs. sq. ft.	9 75	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$.25
Acid, hydrochloric	.06
Acid, nitric	.14
Acid, sulphuric	.06
Ammonia, aqua	.23
Ammonium carbonate	...
Ammonium, chloride	.55
Ammonium hydrosulphuret	.30
Ammonium sulphate	.15
Arsenic, white	.27
Copper, carbonate, annhy	.50
Copper, sulphate	.22
Cobalt, sulphate	.20
Iron perchloride	.40
Lead acetate	.35
Nickel ammonium sulphate	.25
Nickel carbonate	.32
Nickel sulphate	.35
Potassium carbonate	1.80
Potassium sulphide (substitute)	2 25
Silver chloride (per oz.)	1.45
Silver nitrate (per oz.)	1.20
Sodium bisulphite	.15
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.40
Sodium hydrate	.22
Sodium hyposulphite, per 100 lbs.	6.00
Sodium phosphate	.18
Tin chloride	1.75
Zinc chloride, C.P.	.80
Zinc sulphate	.15

Prices per lb. unless otherwise stated.

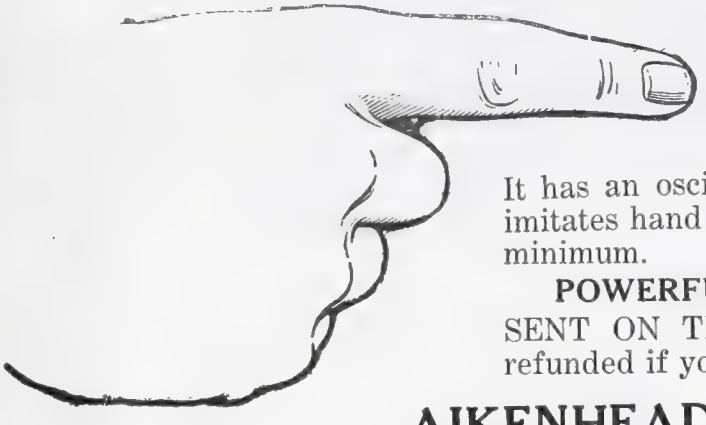
TEN Tapping Jobs for Every ONE You Do By Hand

This is the Capacity of

Aikenhead's Wahlstrom Attachment



Fits Any Drill Press



It has an oscillating movement which mechanically imitates hand tapping, and reduces tap breakage to a minimum.

POWERFUL, DURABLE, TROUBLEPROOF

SENT ON TRIAL. And your money is promptly refunded if you are not satisfied.

AIKENHEAD HARDWARE LIMITED

17, 19, 21 Temperance Street - - Toronto, Canada

Aikenhead's

Van Dorn Portable Electric Drills

"Preferred by men who know"



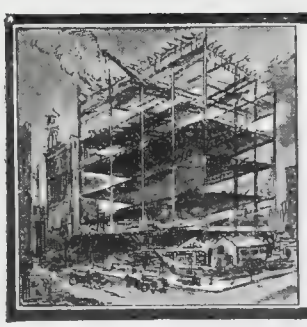
Van Dorn Electric Drills make neat, clean holes 50% faster than the best pneumatic drills.

Van Dorn Drills are both fool-proof and trouble-proof. ASK THE USER.

May we send catalogue.

Aikenhead Hardware Limited

17 Temperance Street TORONTO



INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES



ENGINEERING

Halifax.—The congregation of St. Andrew's Presbyterian Church, at a meeting, decided to proceed at once with the erection of a new church building of brick and stone to cost about $130,000. H. G. Bauld, M.P.P., promised the first subscription of $1,000.

Worcester, Mass.—Sleeper & Hartley, Inc., Worcester, Mass. makers of high-speed automatic wire coiling machinery, have been successful in securing, through their French agent, Mr. Edgar Bloxham, an order from the French High Commission, for a very considerable quantity of wire nail machinery, amounting to more than one hundred machines, which, in addition to regular orders will make it necessary to practically double the staff and operate two shifts. This equipment will be used in reconstruction work in France. The project for a new plant, which was dropped last year, on account of the inability to secure building permits, has been revived.

Peterborough.—At a meeting of the board of works committee of the city council, which lasted until 2 o'clock in the morning, it was recommender that the Russell Townsend Co., of Toronto, be awarded the contract to build the new Hunter Street high level bridge, at an estimated cost of $249,000. At the same meeting Ald. Alex. Murray tendered his resignation, and is leaving for Scotland, where he hopes to regain his health. Ald. Murray was one of the four labor candidates elected by a substantial majority at the last municipal elections. He was an officer in the machinists' union of this city, and last summer was a member of the board of arbitration created to deal with the differences of the machinists and others employed by the Canadian General Electric Co., of this city.

Boston.—The management of Nova Scotia Steel and Coal Company is on the eve of important decisions as to policy, involving determination of the question whether the predominant side of the company's operations will be mining or manufacturing. Nova Scotia owns very valuable iron ore lands and submarine areas at Wabana, Newfoundland. It is conceivable that the company, possessing as it does advantages as to location, will in the not distant future be handling a big ore trade with Europe. But this development must await precise information as to the cost of laying ore down in England. With transportation such an important factor, this cost will naturally be more favorable to the company when the ocean tonnage situation has returned to something nearer normal than exists to-day. It is thus improbable that Nova Scotia will sell any considerable tonnage of ore for delivery in 1919, either to Europe or the United Staes. Nevertheless, in order to continue development of the mine, it is proposed to store a considerable quantity of ore at Wabana during the year. Nova Scotia lost by war or marine disasters four of its long-term chartered steamers, leaving it with one steamer of 8,000 tons under charter. The boats built by the company itself are of relatively small tonnage. As soon as ditions warrant it is proposed to charter or purchase ship tonnage required for coal and ore trade.



The Late JOHN H. HALL.
Founder of the well-known Brantford firm, John H. Hall & Sons, who died in the South recently

TRADE GOSSIP

Will Buy Truck.—The most important item of business transacted by the Dunnville town council at its meeting was the decision to spend $1,200 on the purchase of a motor truck and hose for the Live Oak Hose Co.

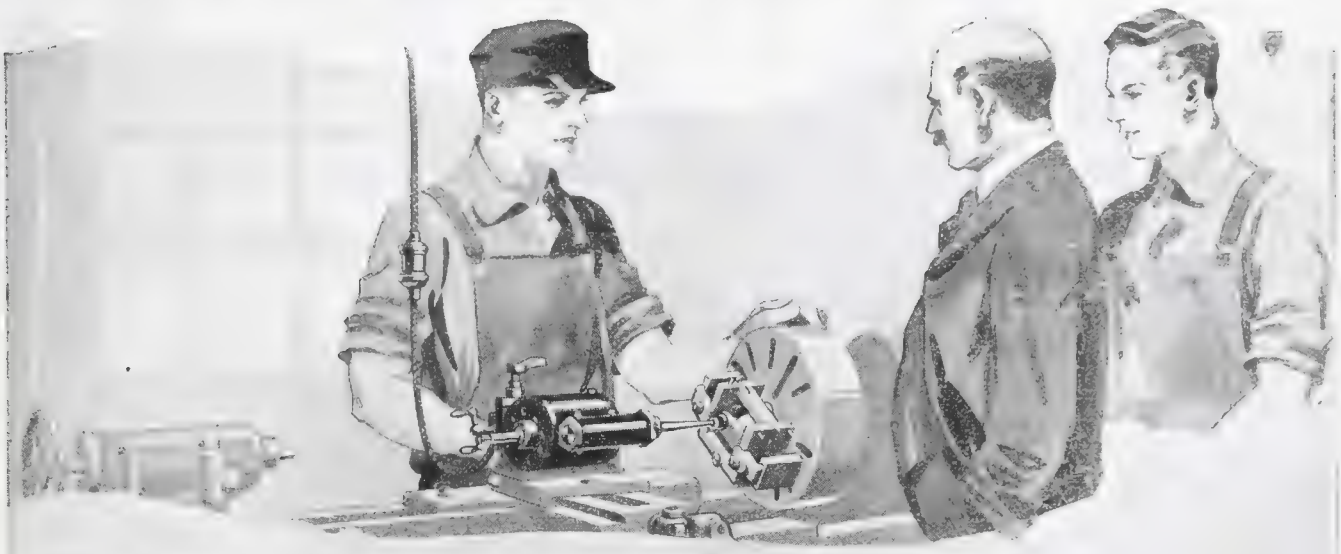
Gas Wells Sold.—The interests of the Canadian Gas Co., Ltd., in the Tilbury East Field, have been purchased by the Union Natural Gas Co., the deal involving about half a million dollars. The Union Co. also get control of certain wells and leases from which they have heretofore been buying gas under contract with the Canadian Co.

Paper Mill Planned.—The Spruce Falls Pulp and Paper Co. have decided on the erection of a large paper mill at Kapuskasing, west of Cochrane, on the line of the Government Transcontinental. After a tour of inspection of officials and engineers of the compay to decide on the location it was decided to start construction in May. A large part of the capital interested is American, while there are some Toronto and Ontario capitalists also holding stock.

Elcetrical Furnaces.— The Electric Furnace Construction Co., Finance Building, Philadelphia, reports a repeat order from the Ford Motor Co., for a "Greaves-Etchells" electric furnace installation. The initial furnace was installed last year and it is reported that it has given extremely good results. In England further orders have been received for furnaces from Woodward, Gatty, Saunt & Co., Ltd., Birmingham, and G. & J. Weir, of Glasgow.

Work for All.—The Chatham branch of the Ontario Labor Bureau are making preparations for finding work for all the returning veterans of that district. Labor conditions in the district are good, and employers have promised that former employees will get their old jobs back, and there are many enquiries from employers for skilled help, one demand from the Dominion Sugar Company being for three hundred men. There is also an ever-increasing demand for farm help.

First Coal Cargo.—The Dominion Coal Company's steamer, "Lingan," with a cargo of 7,000 tons of Nova Scotia coal, has arrived in Montreal, being the first coal boat of the season to reach there. The steamer Hochelaga, of the same service, is also due with a similar cargo. It is the expectation of the company to expedite the shipment of coal this season in order to obviate the heavy exports from the United States which were forced on the country by war conditions. This should operate to a marked extent



"There's only one way under the sun for us to do this job right—that's with a Dumore Grinder"

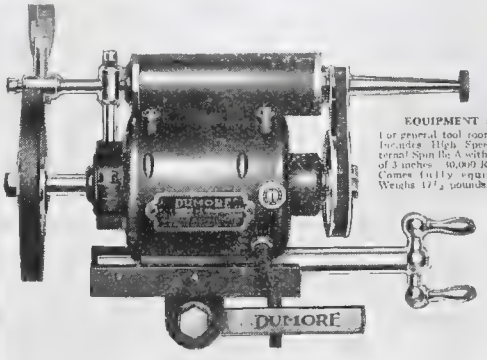
AN appreciation of its construction, plus a knowledge of its past performance, have created this unlimited confidence in the DUMORE grinder.

Accuracy in grinding is possible only with a tool that is mechanically right. The DUMORE, with its dynamically balanced armature and speeds ranging from 10,000 to 50,000 R.P.M. positively insures perfect work, free from chatter-marks, taper or bell mouth. It is light and portable and is the tool for grinding those "hard-to-get-at" jobs.

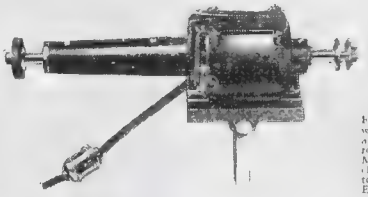
Vitally affecting the very volume of your production—in fact, back of the reputation of your manufactured products—is the quality of the tools you employ.

Is your tool-room equal to its task?

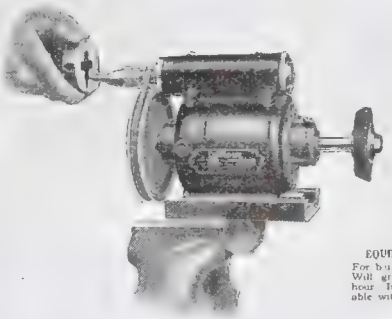
WISCONSIN ELECTRIC CO.
2911 16th Street RACINE, WIS.



EQUIPMENT A
For general tool room use. Includes High Speed Internal Spindle A with reach of 3 inches. 10,000 R.P.M. Comes fully equipped. Weighs 1 7/8 pounds



EQUIPMENT B
For deep internal work. Extension arm has 10 inch reach. 10,000 R.P.M. Arm interchangeable with internal spindle on Equipment A.



EQUIPMENT C
For button dies. Will grind 20 an hour. Interchangeable with A and B

DUMORE HIGH SPEED GRINDERS

in correcting the heavy adverse trade balance between the two countries.

Will Employ Many.—That Canada will be able to absorb all the available labor within the near future, was the opinion expressed by E. W. Beatty, K.C., president of the C.P.R. Mr. Beatty came here to meet the government. "I look for a decided improvement in the labor situation," said Mr Beatty. "I think everyone is looking forward optimistically. The present stress is gradually easing off and everyone is contemplated to step forward more briskly when the peace treaty is finally signed." Touching upon the recent announcement that the C.P.R. would make a determined effort to provide as much employment as possible, Mr. Beatty stated that preference would be given to the man who had served overseas. All former employees of the company who left to join the colors and who have applied for their old positions have been reinstated, while about 2,500 additional returned soldiers had been taken on the company's strength.

Export After Trade.—L. Allerton, representing the Nemours Trading Corporation, New York, an organization of manufacturers' agents for export trade, said at the Windsor Hotel, in Montreal, that he was in Canada for the purpose of getting in touch with the big manufacturers in order to arrange for exports of Canadian products, particularly to the British colonies. The firm had agencies abroad for American goods, but they felt that in Canada certain manufactures might better suit the people in the British colonies. Mr. Allerton felt that with agents abroad, constantly on the spot, and studying the needs of th people, there could be a great extension of Canadian business. The firm had agents abroad at advantageous points, and these kept the firm informed in respect to goods desired. In the work of reconstruction, Mr Allerton felt that both American and Canadian firms should do good business Mr. Allerton is calling upon our local manufacturers, but will leave in May for the purpose of opening up branch offices in Africa, especially at Durban and Johannesburg. Mr. Allerton has been handling export trade for years in various foreign countries for British and American firms.

Ball Bearing Manufacturers Combine.—Of interest to all users of bearings is the just announced reorganization, effective May first, whereby the products of The Hess-Bright Manufacturing Company, the SKF Ball Bearing Company, the Atlas Ball Company, and the Hubbard Machine Company will be sold through one central organization. The new company, under the name of SKF Industries, Inc. will thereby be able to offer a comprehensive line of ball bearings, including the Hess-Bright deep-groove type, SKF self-aligning radial and thrust bearings and ball bearing pillow-blocks and shafting hangers. Through the medium of its engineering organization, backed up by a well equipped laboratory, the new company will be able to place at the service of bearing users the knowledge gained in many years of anti-friction bearings of all kinds. On request, manufacturers' problems will be analyzed in detail and that type of bearing recommended which (independent of sales considerations) is best suited to the conditions met. In addition the laboratory staff will carry on research studies affecting anti-friction bearing design and application. The new company—SKF Industries, Inc.—will be under the direction of B. G. Prytz, President, W. L. Batt, Vice-President, J. P. Walsh, Comptroller, and S. B. Taylor, Sales Manager. The principal office will be at 165 Broadway, New York City, with branches at Boston, Philadelphia, Atlanta, Buffalo, Cleveland, Detroit, Cincinnati, Chicago and San Francisco.

PERSONAL

Frank J. Tone has been made president of The Carborundum Company of Niagara Falls, succeeding the late Frank W. Haskell. George R. Rayner has been made vice-president, succeeding R. B. Mellum of Pittsburgh. F. H. Manley retains the office of treasurer.

Lieutenant R. A. Fisher, U.S.N.R.F., for the past eighteen months connected with the Flying Corps, has joined the sales and engineering force of the J. R. Stone Tool & Supply Company, Detroit, Michigan. Lieutenant Fisher, before entering the Service was connected with the Curtis Aircraft Corporation and the Continental Motors Corporation, Detroit and Muskegon.

TENDERS

TORONTO. — The Board of Control adopted a motion by Controller McBride, aimed at contractors who are not Canadians. It was in the following terms and carried unanimously: "That during the reconstruction period, and until further action hereon is taken by the city council, no contract for the construction of any public work undertaken by the city shall be awarded to any person or company that were not bona fide residents or ratepayers in the Dominion of Canada continuously since 1914." After this Controller McBride strongly opposed awarding a contract for the St. Clair avenue storm sewer, at $73,165, to E. L. Reynolds, a former citizen of Cleveland, who has been living with his son here since 1912 "I intend to be a citizen of Toronto and I have made my home here," said Mr. Reynolds.

MARINE

St. John, N.B.—A steamship service, served with three steamers, will soon be operating between St. John and New York. The steamers will carry about three hundred tons each trip, and one will be en route, one loading at New York, and one unloading at St. John through the season.

London.—Five million feet of lumber are being made up into a huge raft which will be fitted with internal combustion engines and have accommodation on the deck for the crew. She will make the voyage to England through the Panama Canal, and when she reaches home will be dismantled and the timber distributed.

Cleveland.—There is quite a heavy demand for tonnage in the grain trade, and Julius Barnes of the United States Food Administration Grain Corporation has notified the Mobilization Committee of the Lakes Carriers' Association that boats to load 10,000,000 bushels will be wanted in the Lake Superior trade this month.

London.—It has been stated by the London Post Office that tests made in 1905 and 1906 proved that British mails landed at Sydney and forwarded by rail reached their Canadian destination a day earlier than by the St. Lawrence route. The Canadian Government is said to be considering the advisability of adopting Sydney as the permanent port for landing mail.

Victoria.—The official list of 23,000 ton full-powered wooden steamers under contract here for the French Government by the Laing Co., was announced. The company already has launched the Strassbourg, Metz and Mulhouse. The remaining ships are as follows: Canada, Montcalm, Wilfrid Laurier,, Ottawa, Winnipeg, Frontenac, Lasalle, Acadie, Montmagny, Alberta and Nouvelle Ecosse.

Montreal.—A company was incorporated last week, to be called the Canada Transatlantic Company, Limited, with a capital of $1,000,000. The company will be a connecting link between the Canada Steamship Lines and the Compagnie General Transatlantique. It will operate six steamships between French and Canadian ports of about 6,000 to 8,000 tons deadweight. The service will be put in operation about June next. This should lead to a large development of trade between Canada and France.

Washington.—The Shipping Board has formally approved of rates for shipment on the Great Lakes of coal, ore and grain. A meeting was held of the Shipping Board, the Food Administration Grain Corporation, and representatives of vessel owners and shippers. The rates agreed upon are as follows: Ore 80c per ton; coal 42½c per ton, and grain from Lake Superior to Lake Erie and from Lake Michigan to Lake Erie, April and May loading, 3½c and 3c respectively; September, October and November grain loading including winter storage of vessel 5c. The grain rates to Georgian Bay and Goderich were fixed at ½c per bushel; Port Huron ½c per bushel, and Collingwood ½c per bushel under the Lake Erie rate. The rate to Detroit was made the same as to Lake Erie ports.

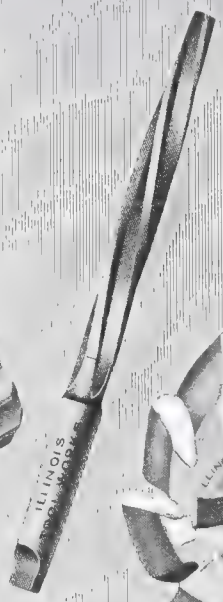
Goderich.—Captain R. F. Pyette, of steamer Sarnian, was presented with a hat by the members of the Town Council of Goderich in honor of being the commander of the first steamer to enter the harbor this season. As his ship was also the first arrivals at Port McNicoll and Port Arthur this is the third hat he has received this season. The Sarnian had a cargo of wheat from Fort William.

ILLINOIS

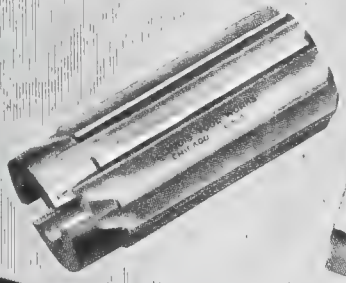
CUTTERS
HOBS
REAMERS

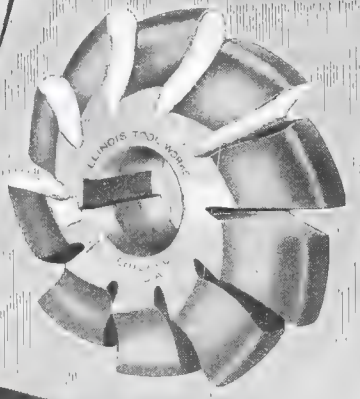
Tools of Superior Excellence backed by Competent Technical Service

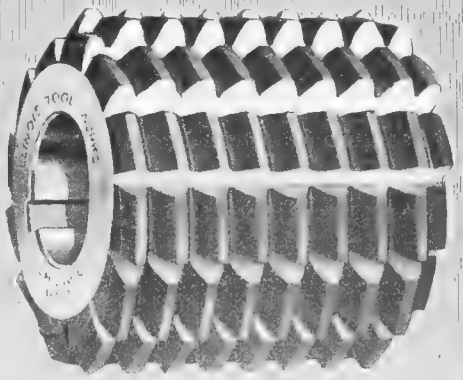












ILLINOIS TOOL WORKS
CHICAGO
U. S. A.

Detroit Store 997 Woodward Avenue. Represented by A. C. Towne, Inc., Buffalo. New York Office, 141-145 West 36th St. Louis G. Henes, 75 Tremont St., San Francisco and Title Insurance Building, Los Angeles.

The captain said that the harbor of Goderich had been greatly improved by the outside breakwater, and he had no trouble in making port with a draught of 19 ft. 6 inches. The harbor could be still further improved by the extension of the north breakwater for 300 feet, and by slightly deepening the inner harbor. As it was it was the only safe harbor on Lake Huron for vessels of large draught.

Collingwood.—With the passing of Capt. Samuel Crangel, who died in California recently, a well-known figure in Great Lakes shipping circles has been removed. Deceased was 80 years of age and was one of the oldest masters on the lakes and had spent over 30 years of his life building freighters, among which were the Rosedale, G. R. Crow, W. D. Mathews, James Carruthers, and J. H. G. Hagerty. He was superintendent of the St. Lawrence and Chicago Steam Navigation Co., Vancouver. At a meeting of the Board of Trade held recently shipbuilding conditions were reviewed and a resolution was passed urging upon the Dominion Government the necessity of keeping its promises regarding ship construction on the Pacific coast. Mr. Tiers, secretary of the Wallace Shipbuilding Co., and Mr. J. J. Coughlan, both stated that the Government, when refusing the yards permission to take orders for foreign tonnage, had promised that they would be kept busy for at least three years on Government construction.

Deal Pending.—Sir John Gibson said in Hamilton that there was nothing new to announce in connection with the negotiations which have been in progress some time for the purchase of the National Steel Car Company by the American Car & Foundry Company.

Detroit.—Establishment of a World Peace Exposition in Detroit that will eclipse all World Fairs ever held in this country is planned. Announcement of the project was made by Mayor Couzens. The organization of the Exposition will be under the direction of Charles M. Schwab. Two or three years will be required to put the Exposition in shape, thus setting the date at 1922 or 1923. Millions of dollars will be required. Fred J. V. Skiff, director of Field Museum of Chicago, will draw plans for the Exposition. Mr. Skiff was manager of the Chicago, Buffalo, St. Louis and San Francisco Fairs. Charles M. Schwab has consented to come here, it is understood, and take the organization of the Exposition in hand. His record during the war in whipping the United States Government's shipbuilding program into shape is considered a guarantee of success.

Brantford Gets Interswitching.—After long and painstaking effort on the part of local manufacturers the interchange switching is now in operation between all lines entering the city. A new connection has been made between the Lake Erie and Northern and the Grand Trunk and a shipment of fifteen cars of hemp for the Cordage Company was the first to pass over it. The city now compares favorably with the larger Canadian railway centres.

Contract Awarded.—The contract for the building of the Educational Building at the Royal Military College has been awarded to Pigott and Healy of Hamilton, and work has been already commenced. The contract price for the erection is $323,000 and the building is to be completed and ready for occupation for the opening of the fall term of 1920.

Work to Start Soon.—Work is to be started shortly on the proposed Hydro line from Port Colborne to Bridgeburg, a part of the Toronto-Bridgeburg system. The entire cost of the system will be $11,000,000, but the amount to be spent on the frontier line has not yet been determined. There are rumors that the Buffalo & Goderich division of the Grand Trunk will be electrified from Bridgeburg to Port Colborne when that line is taken over by the Government.

Big Showhouse for Montreal.—A syndicate represented by Richard Wolstan, a hay and grain exporter of this city, has secured a piece of property in Maisonneuve, and contracts will be let at once for a temporary building. The plans are to have eventually an arena that will hold 20,000 people, and Maisonneuve was selected in preference to Westmount on account of the high cost or land in the latter district.

Canadian Credits.—There need be no fear regarding the security of Canadian credits advanced to Rumania, according to authorities in Paris, if there is no further delay. While the people are in great distress, if relief is afforded quickly there is every prospect of a speedy return to normal conditions. The army is well placed to deal with any threatened invasion of Bolshevist troops from Hungary or Russia, while there is no fear of Bolshevism within the nation.

BIG PLANS OF THE OLD COUNTRY FIRMS

Armstrong-Whitworth Have Amalgamated With A. and J. Main, of Glasgow

The firm of Sir W. G. Armstrong-Whitworth & Co., Ltd., has amalgamated with A. and J. Main, of Glasgow. The combination will be known under the title of Armstrong, Main and Co., Ltd.

This is the second big British engineering combination to be announced this month, the first being that of Vickers-Petters, Ltd. The fusion of big concerns having identical interests is becoming an outstanding feature of the reconstructional period.

The achievements of Armstrong-Whitworth's during the war include the turning out of 14,500,000 shells, 18,500,000 fuses, 21,000,000 cartridge cases, 12,500,000 rounds of field-gun ammunition, 6,000,000 projectiles, 1,075 aeroplanes, 47 warships, 600 merchant ships, 100 tanks and 13,000 guns and mountings, and three airships.

Among the firm's enterprises are a new steel and iron works, the enlarging of the company's shipyards on the Tyne for the output of all classes of commercial shipping, and the amalgamation already referred to of which the engine works' department and the manufacture of hydraulic cranes, dockgates, etc., is the subject. The manufacture of hand pneumatic tools is also to be largely increased and new and more efficient types of tools are to be produced, together with the supply of the whole of the necessary compressing plant for operating the tools. The existing machine-tool trade supplied from the Manchester works is being developed, and new shops and increased plant rapidly installed.

Conversion of works and plant is taking place on a large scale. Their projectile and ammunition works are being adapted for the production of all types of locomotives. It is anticipated that an output of from 300 to 400 heavy-type locomotives per year will be attained in addition to a big supply of narrow-gauge and yard locomotives. The first delivery of locomotives are due for the fall of this year.

The heavy naval and land gun mounting shops are being diverted for the manufacture of marine engines and boilers.

Arrangements are stated to be now in progress for the resumption of the construction of automobiles and electrical plant.

GODERICH HARBOR OPEN FOR SEASON

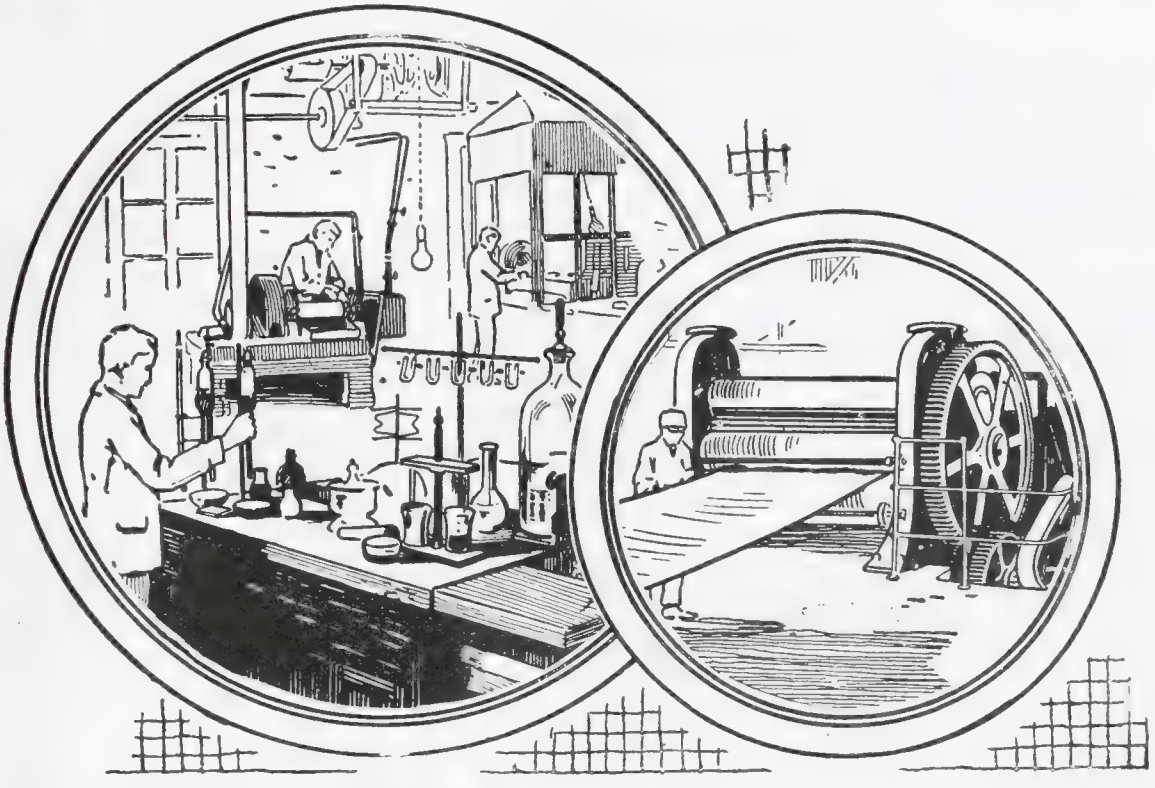
Busy Place Now That Navigation Has Started for the Year

GODERICH.—Navigation so far as Goderich is concerned opened this (Thursday) morning, when the first of the winter fleet cleared. For some time past work has been rushed aboard the four Canada Steamship Line boats, for instructions were to have them ready to proceed as soon as the insurance would become operative on April 15. However, it was noon of the following day when all repairs were completed. By this time the weather was not very favorable, with a strong gale blowing from the east which increased during the afternoon, and by evening a fairly heavy sea was rolling. Early this morning the wind shifted to almost south and at 9.30 the Martian, with Capt. McIntyre on the bridge, cast off her lines and started her first trip for the season. With intervals of a few minutes, the Bickerdike, Capt. Johnson; Midland King, Capt Aikin, and Ionic, Capt. Wing, left their winter berth for the head of the lakes. All these vessels will load grain at Fort William.

Superintendent McLaren, of the Canada Steamship Lines, has been in town for the past few days in connection with the clearance of that company's steamers which have wintered here. Mr. McLaren says that their entire upper lake fleet is now in commission.

To-day at noon when the unloading of the Negaunee was completed the last of the winter cargoes had been taken into the elevators.

There is very little stir on the three



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American vessels, Brietung, Negaunee and Central West. Only on the latter have the engine room crew arrived and they have quite extensive repairs to make. There is no definite information available as to when they intend to open the season, but it will no doubt be quite late.

The Algoma Central boats, the Agawa and Home Smith, have both their forward and after crews busy fitting out. It is expected that they will clear early next week.

TROUBLE COMING OVER BRIDGE ORDER

Injunction Talked of Because the Structure is Likely to Exceed First Figures

Peterboro'.—R. R. Hall, solicitor, served the city with a notice threatening to seek an injunction to restrain the city from entering into a contract with the Russell Townsend Company, of Toronto, for the construction of the Hunter Street overhead bridge, estimated to cost a quarter of a million dollars. In his letter, Mr. Hall states he is acting for Wm. Rudkins, a ratepayer. The grounds for the threatened injunction, according to Mr. Hall's letter, are based on the fact that only $260,000 was voted for the construction of the bridge, and that taking into consideration land damages and engineer's fees, this figure is likely to be exceeded, and that the Board of Works in recommending the acceptance of the Russell Townsend Company's tender on a lump sum fee, plus cost, have discriminated against several other contractors who tendered on the same basis. It is the intention of the parties supporting the injunction suit to make each member of the city council who votes in favor of the proposed agreement with the Toronto firm personally liable for any loss, costs or damages in excess of the amount originally voted for the work.

Mr. Hall also alleges that Mr. Frank Barber, the Toronto engineer in charge of the work, has not sunk any test pits to determine the depth to which the foundations of the several piers are to be sunk, and that the plans showing the depth to which the piers shall be sunk are wholly incorrect and the piers will have to be sunk to a much greater depth, which will very materially add to the cost of the construction of the bridge.

Mr. Hall states that the tenders that have been received by the Council of the construction of this bridge, exclusive of land damages, and engineer's fees, clearly exceed the amount authorized by the ratepayers to be expended in the construction of this bridge and even these twelve tenders that have been received are estimates only and are not in fact bona fide tenders that the contractors are willing to be bound by, as the lump sum cost of the construction of the bridge.

CHINESE PEOPLE

(Continued from page 450.)

insurance, are matters with which every shipper should be familiar, and terms of sale f.o.b. or c.i.f. accurately understood. The more one knows of a country the easier it will be to do business with that country, but this knowledge cannot be obtained without some thought and study

It is generally regarded that China presents the greatest undeveloped overseas market for foreign goods that exists anywhere. No one who has made a study of the question has any doubts upon the subject. It is inconceivable that 400,000,000 people inhabiting one of the most productive portions of the world can forever fail to be influenced by the activities of other countries and peoples. As it is, even during the period of the war, with many factors operating to prevent expansion, the foreign trade of China has yearly increased, reaching a maximum last year of over $1,000,000,000 gold, of which imports amounted to $597,000,000 and exports to $462,000,000. This is no inconsiderable volume of business, yet it only represents a per capita trade of about $2.50 per annum, or an import per capita of less than $1.50. Expansion and increase may perhaps be slower than in many other countries, for many factors are concerned in the problem; and undoubtedly the purchasing power of the mass of the people is lower than in almost any other country, but this must improve with time. The country is not over populated, but its methods of production are primitive and insufficient, and as before stated, transportation facilities are urgently needed, but in a measure this has been provided for, and will eventually be established. In order to carry out this, foreign material will be required, which Canada is in an excellent position to furnish in part.

Some Points Upon Overseas Trade

Overseas trade differs in many respects from home trade, yet in other respects it is much the same.

Very few Canadian wholesale houses attempt to do business at home by correspondence only, therefore why should they expect to do an overseas trade with foreign countries by methods which are found to be unsuccessful at home? It is unfortunate that business houses in China, with few exceptions, make little attempt to push the sales of any of the articles for which they are agents. They take on an agency for almost everything, but make little effort to push trade in the interior. There are some firms that employ travelling salesmen who make periodical visits to other ports, but their number is not great, and consist mostly of the representatives of drugs, soap, chemicals and dyes, biscuits, hardware and sundries. The cigarette establishments and the kerosene oil companies have their own resident managers and salesmen in all parts of the country. Nearly all advertising of special lines and proprietary articles must be done by home manufacturers. Personal representation then in many lines of special manufacture and new products is the means most likely to meet with success in establishing a connection in the China market. All manufacturers of such lines as building hardware, roofing, paints and oils, special machinery, gasoline engines, electrical supplies, enamelled ware and similar products, if desirous of or seriously wishing to develop an overseas trade should, if possible, send their personal representative over the ground at least once. It is quite impossible for any one to judge intelligently of China or the China market without having seen and investigated both for himself. The same also applies to the markets of Japan, the Philippines, the Straits Settlements and India.

The representative should not be too young, and should have an intimate knowledge of the business which he represents. If possible a principal or some member of the firm should be the first to visit the overseas markets. The firm would thus acquire a personal knowledge of the country and its trade conditions; they would also be able to form business connections and to establish agencies, which would be of value for future operations. In the machinery and engineering trades any representative sent abroad should have technical knowledge of the lines which he represents, and be able to talk with a clear understanding of his subject, for he must meet engineers and practical men, and be in a position to answer their inquiries and to meet their criticisms.

A FREE MARKET

All subsidies and control over prices and material with regard to orders for pig iron, manufactured iron and steel and tin plates will be withdrawn April 30, subject to provisions of existing contracts and any export regulations. This means that manufacturers and merchants in the United Kingdom are free to make their own terms with regard to price and delivery from May 1.

Mr. James H. Kelly, late engineer of the Brockville Waterworks, passed away at his home after an illness of four weeks. Deceased, who was 82 years of age, came to Canada as a child, settling with his parents in the little village of Bytown, now Ottawa. His father was a marine engineer, and the son followed in his steps. When still in his 'teens Mr. Kelly came to Brockville and entered the employ of Jones Bros., who conducted a forwarding business on the St. Lawrence and its tributary streams. He later became engineer with Chaffey Bros., whose shipyard was located on Gourlay Street, now occupied by part of the James Smart Mfg. Co. From there he went as engineer on one of the vessels of the Northern Transportation Co., their fine line of boats plying between Ogdensburg and Chicago. Retiring from

marine work he became foreman in the mechanical department of the Smart & Shepherd Foundry, and later the James Smart Foundry. He was appointed engineer of the Brockville Water Works in 1898, which position he occupied until his retirement. The deceased was a widower and leaves two sons and two daughters.

COURT FAVORS CANADIAN CAR CO.

Judgment in Protracted Case Has Been Given Against American Can Co.

Montreal.—Senator Curry, chairman of the board of directors of the Canadian Car and Foundry Company, received the judgment in the case of the Car Company against the American Can Company, which was rendered by the Appellate Court of the State of New York, in favor of the local company.

The amount involved, including interest, was about $750,000, and arose out of the famous Russian shell contract.

It will be recalled that the American Can Company entered into an agreement with the Car Company to make use of the fuse plant at Dayton, Ohio, for the filling of some of its own war contracts with the Russian Government, but when the Russian Imperial Government was overthrown the American Can Company desired to get a judicial opinion on the matter of payments to safeguard its own position. This was obtained in one of the lower courts in favor of the Car Company, but the American Can Company decided to carry the matter still higher, and it is this judgment which has been just received. Senator Curry stated that it was really stronger in favor of their company than the judgment of the lower court.

This disposes of the largest item still outstanding in connection with the Russian shell contract still to be settled. There is still a claim for approximately $200,000 arising out of tariff drawback on unexported shells, which has to be settled in the United States by a special Congressional bill, as there is no clause in the Tariff Act to deal with such a circumstance. The last Congress expired before this bill was completed, so that it will have to come up again at the next session.

These two amounts, with a few smaller ones, brought the total outstanding unsettled claims to slightly over a million dollars.

The University of Illinois, Engineering Experiment Station have issued Bulletin No. 107 dealing with the analysis and test of rigidly connected reinforced concrete frames. This publication is a valuable addition to the literature on the subject of the strength of reinforced concrete and gives the formula and results which have been derived for a number of very interesting conditions hitherto only determined by the means of very wide approximations.

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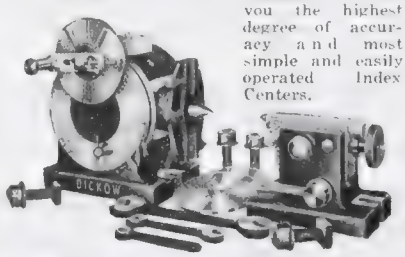
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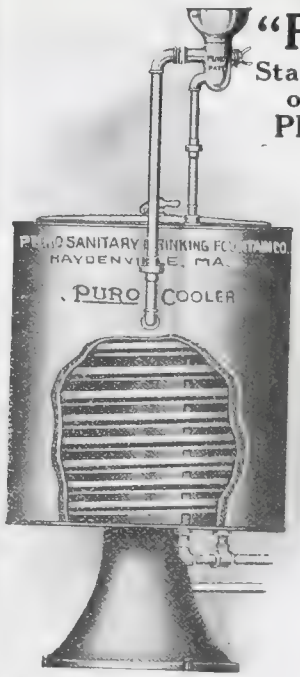


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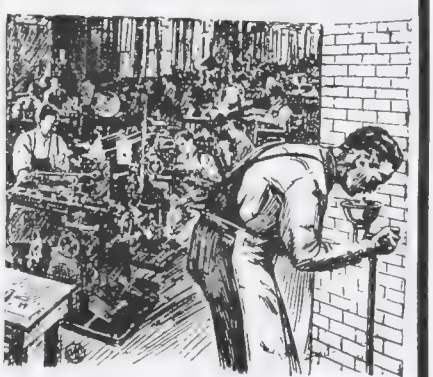


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TRADE WITH RUSSIA

NEW YORK.—Soviet Russia wants to buy great quantities of supplies in the United States, and if trade is opened is prepared to place at once in European and American banks $100,000,000 in gold to cover the cost of initial purchases,

This alluring avowal was made by L. C. A. K. Martens, who from temporary headquarters at 299 Broadway announced that he had received from Foreign Minister George Chicherin the appointment as representative of the Russian Soviet Government in the United States with instructions to negotiate for the opening of trade relations.

"To insure a basis of credits for additional Russian purchases in the United States," he said, "my Government is ready to submit propositions which I believe will be acceptable to Americans interested in Russian trade."

Mr. Martens was formerly a member of the Russian Social Democratic party and now amiably admits that he is a Bolshevist. No shooting irons are visible in his Broadway office. In fact, the first envoy of the new Government seems to be a man of peaceful disposition as well as of business directness. He is blue-eyed and light-haired and speaks English well.

He said that as a first step he had sent his credentials to Washington with a memorandum on Russian conditions and an outline of the desire of his Government to re-establish trade with the United States.

"The purchases I am empowered to arrange," he continued, "will be commensurate with the needs of the 150,000,000 people of Soviet Russia. Russia is now prepared to purchase in the American market great quantities of such commodities as railroad supplies, agricultural implements and machinery, factory machinery, tools, mining machinery and supplies, electrical supplies, printing machinery, textile manufactures, shoes and clothing, fats and canned meats, rubber goods, typewriters and office supplies, automobiles and trucks, chemicals, medical supplies, etc.

"Russia is prepared to sell flax, hemp, hides, bristles, furs, lumber, grain, platinum, meals and minerals."

In a short time, he said, he would appoint a commercial attache and open offices in New York for large scale purchasing headquarters. He was also planning to incorporate a "Board of Trade of Soviet Russia" to organize trade relations and furnish a medium through which American trade could get practical contact with Russian commerce.

Germany Not in It Now

Remarking that Russia before the war got the bulk of her imported manufactures from Germany, Mr. Martens said: "As Germany's production for a considerable time remains subnormal Russia is all the more an open market for other countries. In a trade sense as

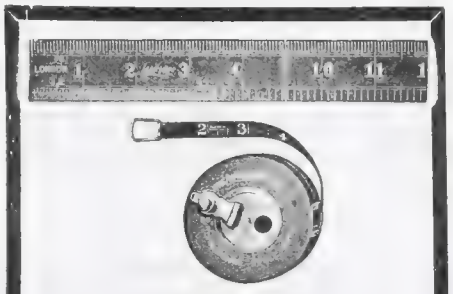
well as in a political sense Russia is starting anew. It is quite obvious that the manufacturing nation that first secures a large amount of the Russian foreign trade at this time will be in an advantageous position for the future as well. I may state that large European manufacturers are already well informed as to the possibilities of trade with Soviet Russia and are laying their plans for it as soon as the present impossible blockade conditions are relieved.

FORT WILLIAM.—The Canadian Pacific Railway announces that, weather and ice conditions permitting, their first upper lake steamer for this season will leave Port McNicoll for Fort William Thursday, May 1, followed by five sailings each week thereafter. Freight for Port Arthur, Fort William and northwest points, is now accepted for routing via Port McNicoll.

Caustic Soda

There is only one safe and speedy method of handling caustic soda as received in iron drums. Punch two holes in the lid of an unopened drum, place the drum in a tank, cask or convenient receptacle. Send a steam jet by a pipe into one hole and open the valves. It is possible by this kink to make up 30 per cent. solution speedily and safely. To dilute is a simple matter and to duplicate strength a hydrometer is the easiest method. The weight of caustic being known and the capacity of receptacle the amount of alkali per gallon of solution is easily ascertained. The hydrometer used was graduated 1,000-1,200 and as the purpose in view involved very great dilution (about ½ per cent. being found sufficient) the solution was made up 1,200 in strength; a small measured quantity of the strong liquor being placed in a much larger measured quantity of water. Alkali, like all forms of grease, being now expensive and difficult to procure, it is thought that caustic can be substituted for milder alkali, such as soda ash, if the proper means of handling and using are set forth. As a grease shifter caustic is ideal, but it needs care and proper handling, otherwise injury may result to the experimenter unversed in its nature. A foot with strong boiling caustic liquor spilled over means painful burns and ruined foot-gear, while a spot or two drills holes in any woollen clothing; its action on wool is extraordinary and must be experienced to be credited.

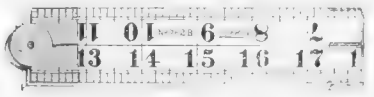
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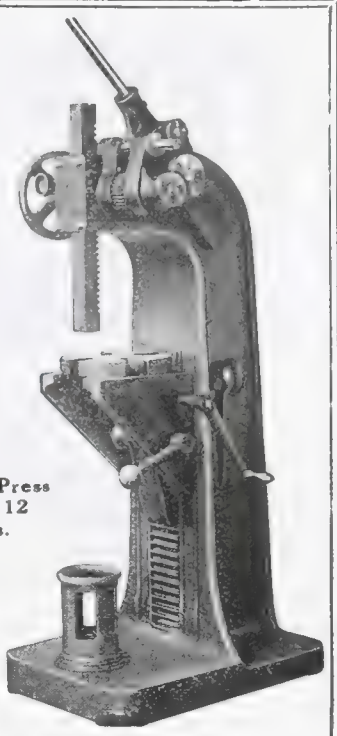
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WANTED—TWO TRAVELLING CRANES AND runways. Cranes to be from five to ten tons capacity with runways from 70 to 80 feet wide. Reply Box No. 571, Canadian Machinery.

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Large Quantity of
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In excellent condition.

Automatic and Hand Screw Machines
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1", 1½", 1⅝", 1¾", Turret Screw Machines.
No. 1, and No. 2 B.G. Automatic Tapping Machines.
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Write for particulars and prices.

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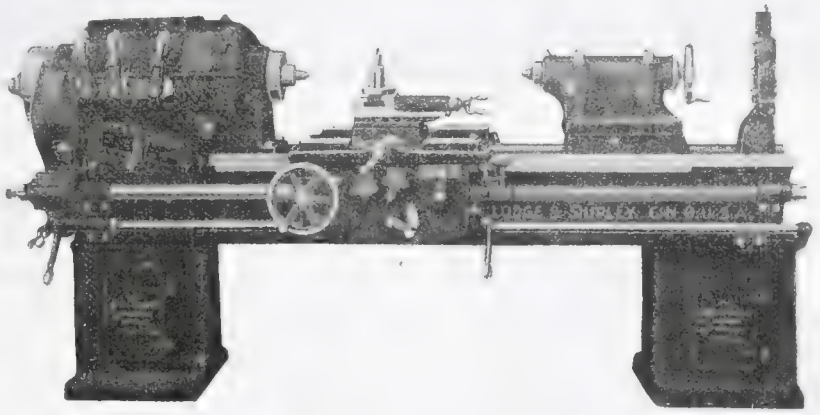
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Grind your cutting tools in exactly the right way to get best results—and you save time. That's obvious. It is precisely that that this Tool Grinding Chart enables you to do.

It has been adopted as standard by many firms that found it a long way better than guess work.

CANADIAN MACHINERY would like to see this Chart in every shop in the Dominion. Mail the coupon below for your copy to-day.

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No. 3—Cincinnati Universal Miller
5 No. 0 Steptoe Hand Millers
13″ x 5′ 6″ New Carroll-Jamieson Quick-Change Lathe
14″ x 6′ New Carroll-Jamieson Quick-Change Lathe
15″ x 6′ New Sidney D.B.G. Quick-Change Lathe, swing 17″
15″ x 8′ New Sidney D.B.G. Quick-Change Lathe, swing 17″
17″ x 8′ New National Quick-Change Lathe
3 17″ x 8′ New Sidney D.B.G. Quick-Change Lathe, swing 19″
17″ x 10′ New Sidney D.B.G. Quick-Change Lathe, swing 19″
18″ x 24″ New Rahn Larmon Lathe, D.B.G. Quick-Change
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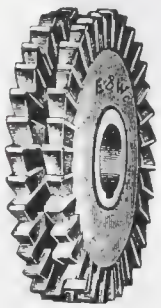
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Standard and Special Milling Cutters of all descriptions, Gear Cutters, Hand Reamers, Shell Reamers, Chucking Reamers and Taper Pin Reamers, Lathe Mandrels and Arbors, Metal Stamping Dies, Gauges, Jigs and Fixtures, Etc.

All equipment required for rapid and economical production of interchangeable parts. Prompt attention to all work.

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6	"	4	x	1/2	x	1"	2	"	6	x 1 x 1"
2	"	4	x	5/8	x	1"	4	"	6	x 1 x 1¼"
2	"	4	x	3/4	x	1¼"				

National High Speed Slitting Saws

9	Only	2½	x	3 64	x	7/8	4	Only	5	x 3/32 x 1
10	"	3	x	1/8	x	1	1	"	6	x 1/8 x 1
20	"	4	x	1 8	x	1	4	"	6	x 3/32 x 1
12	"	4	x	1 16	x	1	12	"	6	x 3/16 x 1
6	"	4	x	3/16	x	1	6	"	6	x 3/16 x 1¼
6	"	4	x	5/32	x	1	2	"	7	x 1/8 x 1
20	"	4	x	3/32	x	1				

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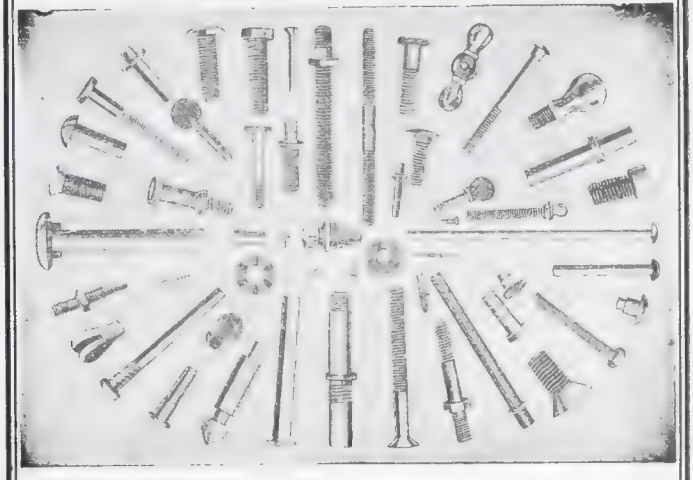
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Automatic Screw Machine
ACCURACY Products QUALITY

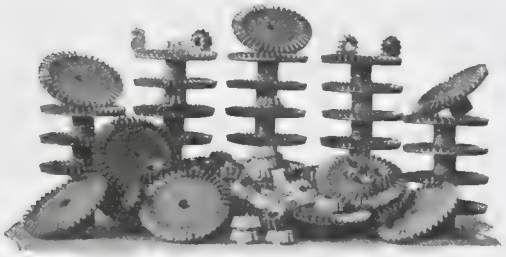
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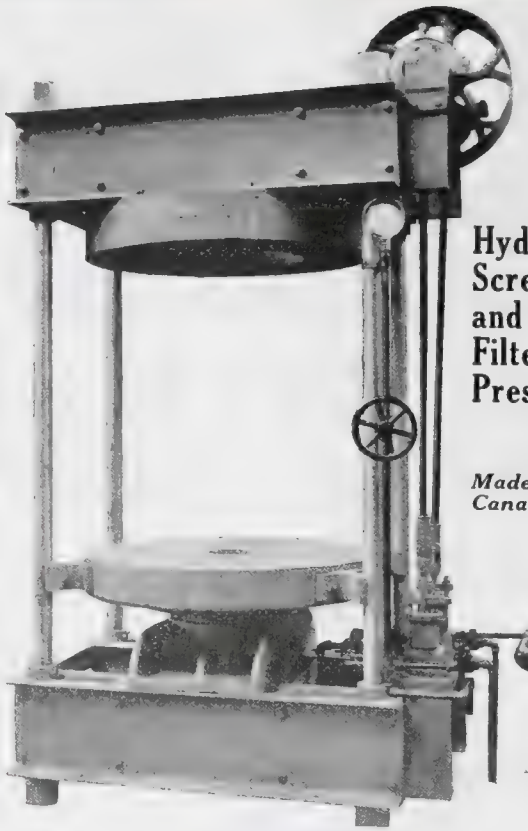
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Prompt Service.
Moderate cost.
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Made in Canada

Hydraulic Truck Tire Press

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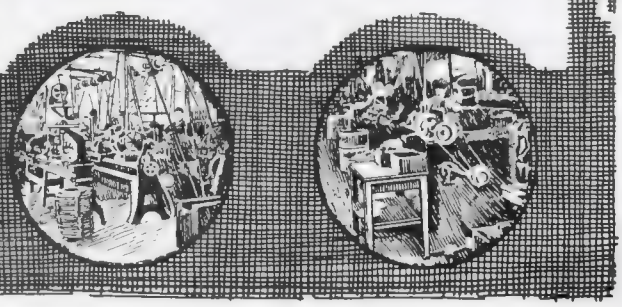
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Consult us on your machine problems

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If you have a lathe
a drill
a milling machine
a planer
a chain block
a chuck
a motor
a crane
a stock of belting
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a compressor

or any other machine shop equipment for which you really have no further use, why not turn it into *cash?*

Someone may be looking for just the machine you may want to sell. Let us bring you together.

A "classified" ad. in CANADIAN MACHINERY, costing a few cents per issue, has done wonders for others. Why not try it?

Turn to the "Classified" section in this issue and see what is being offered and what is wanted at present.

CANADIAN MACHINERY
Classified Advertising Section
143-153 University Avenue TORONTO, ONT.

THE FINANCIAL POST
OF APRIL 26TH CONTAINS:

DOMINION STEEL'S SHIP PLATE DEAL

Arrangement Promises to Work Out Well for Company and Shareholders

The continuance of work on the Dominion Steel Corporation's rolling mill at Sydney, N.S., brings to mind that this company has a very favorable agreement with the Dominion Government, and one which should be a good thing for the shareholders.

The company agrees to make plates (basic open hearth) to such thickness or size as required for shipbuilding, the Government to purchase 250,000 gross tons, and have the option of increasing the amount to 375,000 tons. Deliveries are to be made at the rate of 50,000 tons per year, the Government retaining the option of increasing this to 75,000 tons per annum.

The price for such plates is $4.15 per 100 lbs:, or $83 per ton, and provision is made that this price may be increased to $4.25 or $85 per ton.

You will find further interesting matter on this subject in THE POST of April 26th.

Farmers, Trusts, and Publicity (Editorial)

The Five Best Industrials

United Hotel Co.'s Deal for Clifton Patronage and the National Forest Menace

The Steel Trade Items Here Reproduced Also

A Commission Like Ontario's for Nova Scotia

Commission of Utilities in B. C. and New Capital

Government Failure in Operation of U. S. Railroads

Dominion Steel Strikes Hard at Scotia's Claims

Rubber Company Has Record Year —49% on Common

Price Bros. & Co. Show Nearly $1,500,000 Profits

Sawyer-Massey Adopts a House-Cleaning Policy

Production of Mining Corporation of Canada Falls Off

Bank Clearings Were Affected by Holiday

Higher Savings Balanced by Current Loans

Says Banks Are a Handicap to Retail Section

How is Germany to Pay Billions of Indemnity?

Opportunities for Business in Balkan States

How to Float Foreign Bonds is a Problem

Conditions Are on Quiet Side in Bond Market

S. Vancouver to Consolidate its Tax Arrears

THE PRICE FOR STEEL SOON TO BE ADJUSTED

Between the United States Railroad and Industrial Boards

NEW YORK.—From a technical market standpoint, according to Hayden, Stone & Co., the most encouraging event of the week was a new high price on this movement for Steel common. The figure reached is the highest since last November. Undoubtedly this anticipates an agreement between the railroads and industrial boards on the price level for steel. This is one of the acts to which the market has been steadily looking forward. It will be important, not only in the material improvement which it should shortly bring about, but even more for its psychological effect. No doubt it will be shortly followed by an agreement on the price for coal.

You will find further interesting matter on this subject in THE POST of April 26th.

Regina's Tax Rate Boosted by Five Mills

Beck's Tactics Give N. Toronto a Bad Setback

Saskatchewan Dealers in Farm Lands Organize

Steel Confusion Now Increased by Naval Board

Business Building News Items Appear Each Week in *The Financial Post*

The above are only a few of the many subjects of real profit-making interest to Canadian men of affairs which have been dealt with by expert writers and editors in THE POST of April 26th. THE POST will keep you informed on Canadian business matters in a way unrivalled by any other publication. Send for a subscription to-day. The price is $3.00 per year, and you have only to fill in this form:

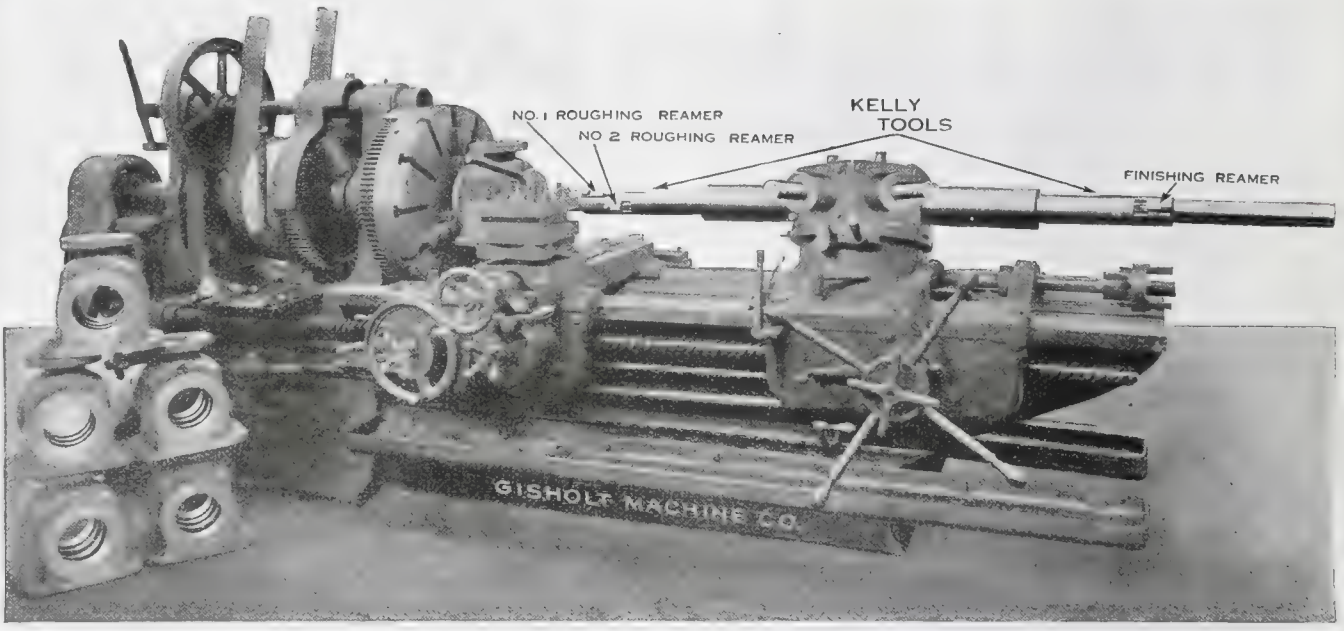
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Kelly PRODUCTION Tools

Kelly tools are shown above in operation upon a 24" Gisholt Lathe. The steam engine valve chests, being machined, are of cast iron and are rough bored and semi-finished with two reamers in one bar. They are then reamed with finishing reamer in the other bar. These reamers, being properly piloted, pass over three ports and give a true, smooth hole to close limits.

The hole is approximately 5½" diameter. By inserting a different sized set of reamers IN THE SAME BARS, a much larger sized job of a similar nature is performed.

These reamers are all ADJUSTABLE and have REPLACEABLE HIGH SPEED OR STELLITE blades.

KELLY TOOLS WILL SAVE EXPENSE AND WORRY

DELIVERIES 1-10 DAYS

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The Kelly Reamer Company

CLEVELAND, OHIO, U.S.A.

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Paris: Burton Fils Latin America: Fox Bros. & Co., New York City
Stockholm: G. A. Lindstedt & Co. 40 Domestic Agencies

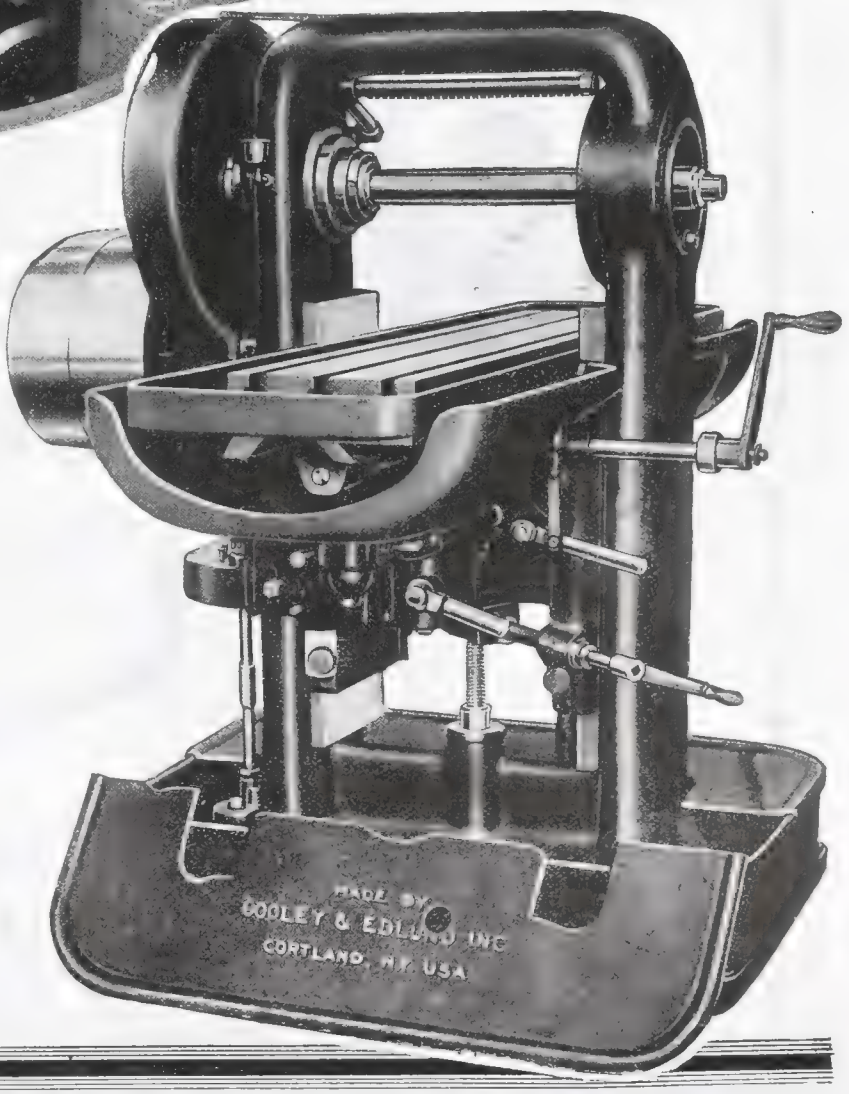


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MILLER

Breaking Production Records

Forcing the feed on the "BRIGGS" to an extent impossible on any other machine.



THE photograph shows twelve belt lacer jaws clamped together on the table of a Briggs Milling Machine, where two straddle-mounted cutters mill the channels at one setting, though the stock is cold rolled steel, one inch thick. 15 minutes completes the operation, this speed being attained by forcing the feed to an extent impossible with any other milling machine. There is no chatter—the surface is "finished" when it comes from the machine.

Rigid, powerful and easy to operate. Takes wide, deep cuts without showing least signs of distress, and will produce accurate work when running at a high rate of speed.

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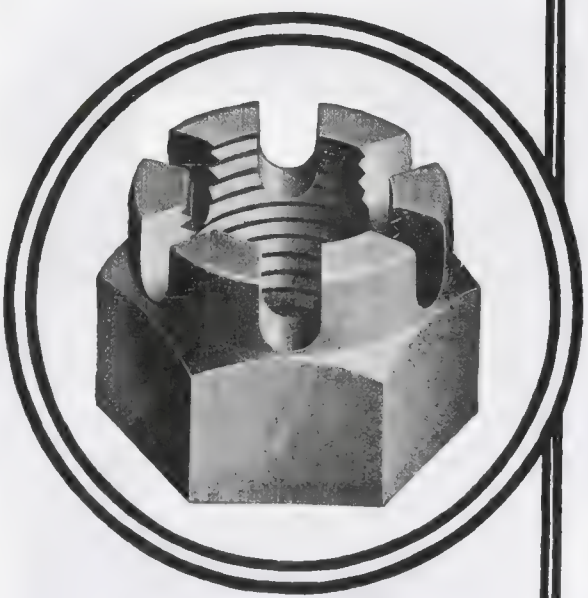
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Williams & Wilson, Ltd., Montreal

FOREIGN AGENTS: Allied Machinery Company of America, France, Belgium, Italy, Switzerland, Russia, Scandinavia and Barcelona; C. W. Burton Griffiths & Co., London, Manchester and Glasgow; Andrews & George Co., Tokyo, Japan.

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STANDARD OR SPECIAL



READY FOR DELIVERY

NUTS—Plain—S.A.E.
Castellated—S.A.E.
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SCREWS—Cap V—U.S.S.—S.A.E.
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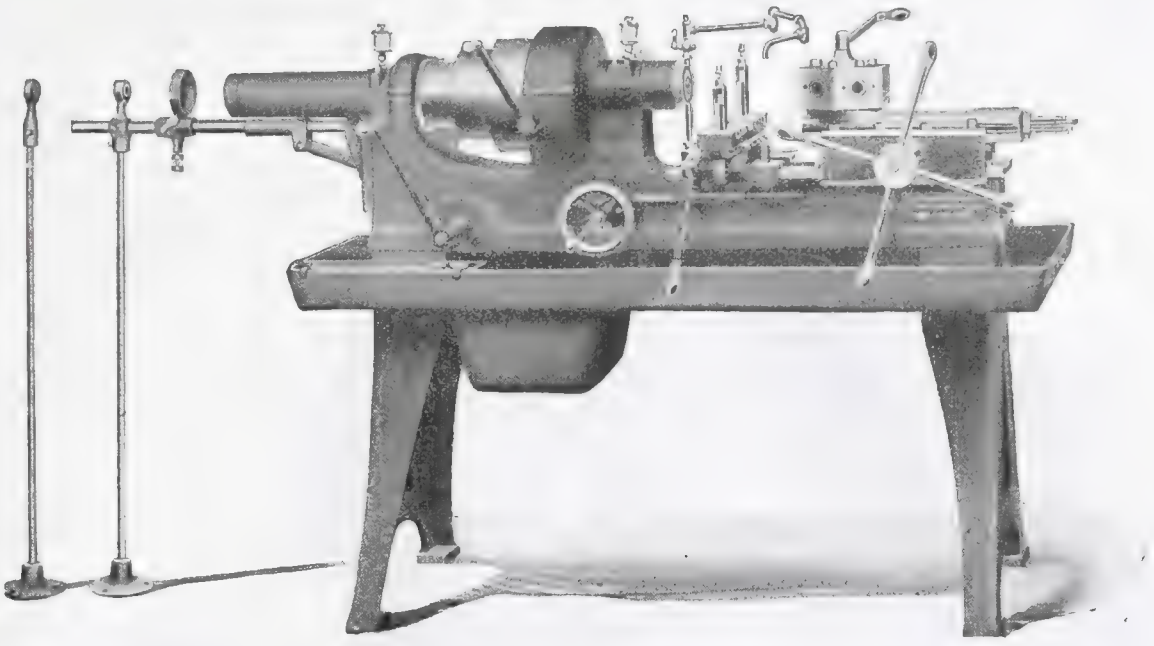
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Special Screw Machine work, sizes up to 2¼" diameter, 10½" long.

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No. 2 Turret Screw Machine

The No. 2 Turret Screw Machine is particularly fitted to small parts manufacturing. Many fuse parts and adapter contractors have used large batteries with marked success. Now you will find them just as profitable and reliable for your peace work.

The machine is built with both plain head and geared friction head construction. The geared friction head adapts it particularly to threaded work up to the capacity of 1 in. x 6-in. for alloy steels and other tough metals requiring the power obtainable through this construction.

With our increased output we can quickly equip you, and, as with all W. & S. machines your production can be speeded by equipping from our immense stock of standard tools.

Turret Lathes and Screw Machines from 5/8 in. x 4 in. to 4½ in. x 44 in. bar capacity. Maximum swing 21½ in.

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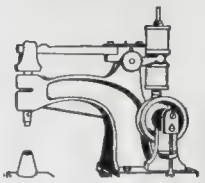
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THE HAMMER WITH THE HUMAN STROKE



SHOULDERING THE WORLD'S RIVETING

THE HIGH SPEED WAY: DOING THE WORK OF FOUR HAND RIVETERS





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The High Speed Hammers
HEAD RIVETS COLD

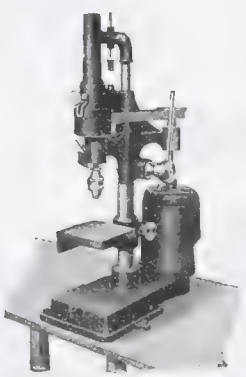
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A Rivet a Second up to 3/16"
A Rivet in 2 seconds, ¼" to ⅜"
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BUILT IN 8 SIZES

To head rivets cold from the smallest to 1½" in diameter.

Send for High Speed Hammer Book



HIGH SPEED DRILL PRESS

MODEL E-50 HIGH SPEED
MOTOR-DRIVEN BALL-BEARING

Sensitive Bench Drill Press

SPECIFICATIONS:

Height Over All	24"
Base	7½x18"
Diameter of Spindle	7/16"
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Weight	62 lbs.
Capacity	From Smallest to ¼" Drills

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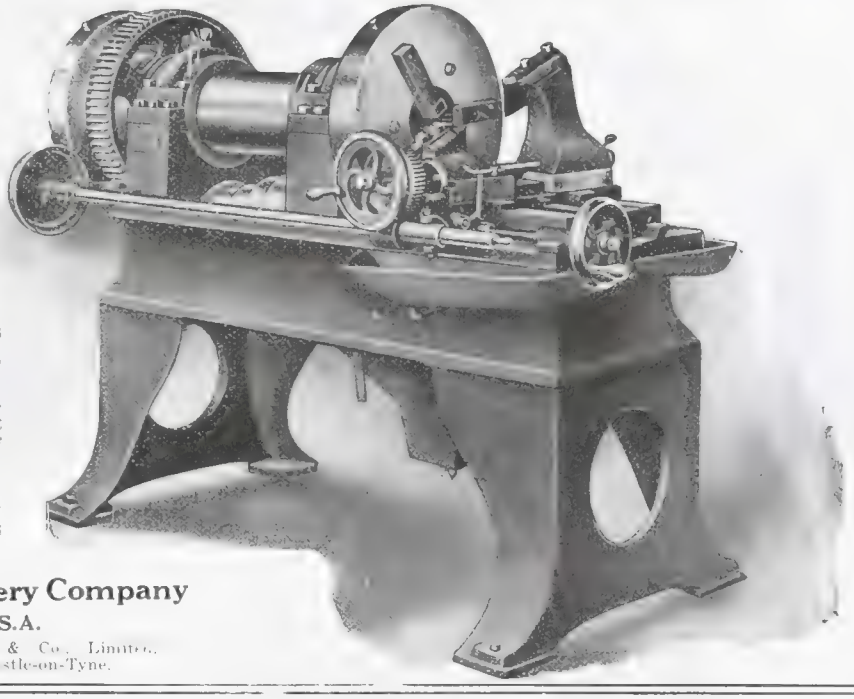
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Cut Your Cutting-off Costs in HALF

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Patent Cutting-off and Centering Machines

TO say that the Hurlbut, Rogers Cutting-Off and Centering Machine will **double your production** and **cut your costs in half** may seem like a broad claim. But this is just what this machine will do compared with any ordinary machine of its kind.



Hurlbut, Rogers speed and efficiency is easily explained. Instead of only one, it is equipped with two cutting-off tools —one cutting up and the other down. In this way they hold the work against each other and finish a job in just half the time and do twice the work.

You can't afford to be without this machine. It saves real money. Let us tell you more about it. Write!

The Hurlbut, Rogers Machinery Company

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Foreign Agents England: Chas. Churchill & Co., Limited, London, Manchester, Glasgow and Newcastle-on-Tyne.

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SPECIAL MACHINERY
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Have removed to larger and more modern premises where we have better facilities and equipment for the efficient handling of your needs.

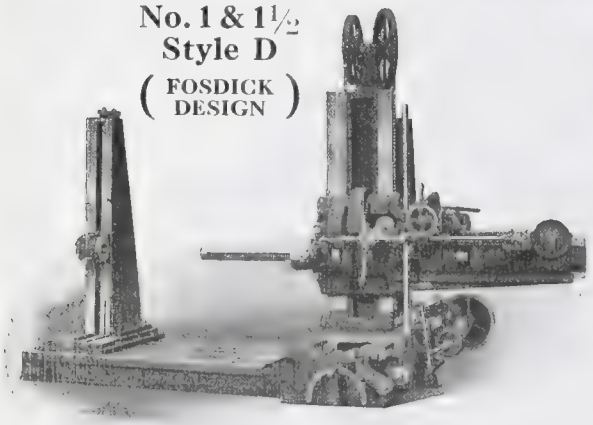
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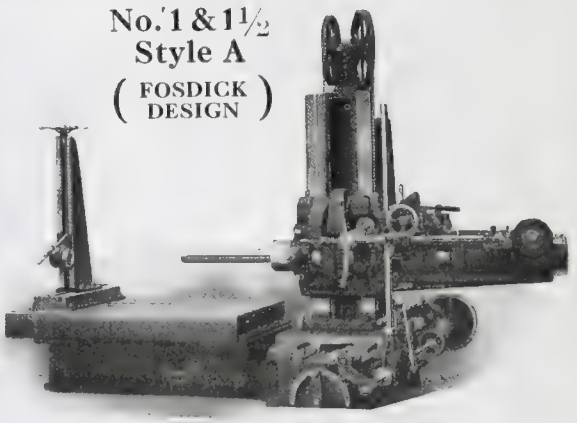
G Boring, Drilling & and Milling L Machines

No. 1 & 1½ Style D (FOSDICK DESIGN)





No. 1 & 1½ Style A (FOSDICK DESIGN)

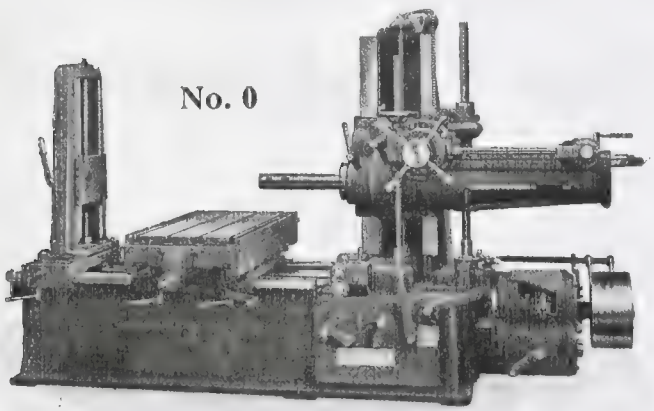


SPECIFICATIONS:

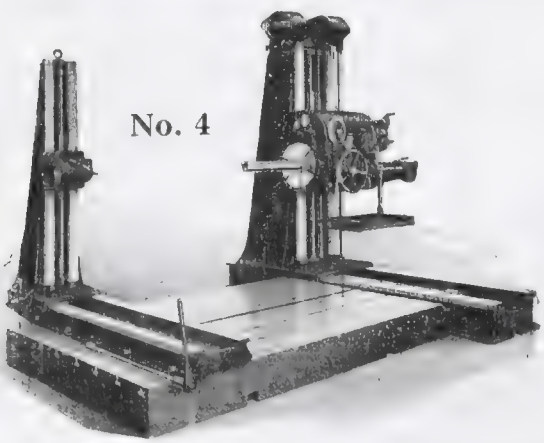
Size of Machine.	No. 1	No. 1½
Diameter of spindle	3½"	4"
Morse Taper No.	5	6
Traverse of spindle	28"	30"
Vertical adjustment of head	36"	54"
Horizontal adjustment of column	36"	62"
Maximum, work bed to centre of spindle (Style A)	44"	62"
Maximum, work bed to centre of spindle (Style D)	58"	76"
Size of work bed	42" x 72"	42" x 120"

Size of Machine.	No. 1	No. 1½
Speeds (4 to 255 R.P.M. geometrical progression)	12	12
Feeds, in all directions (.007 in. to ¼ in. per revolution)	8	8
Motor horse power	7½	10
Floor space	9' x 15'	11' x 19"
Total height of machine	8' 9"	10' 3"
Net weight (Style A machine)	16,000 lbs.	21,000 lbs.
Net weight (Style D machine)	15,000 lbs.	19,500 lbs.

No. 0



No. 4



Don't let the handling of those awkward, unwieldy pieces cause you trouble and keep down production and profit.

G. & L. Machines are the master of the situation.

Their convenience, simplicity, easy control and great accuracy will prove invaluable to your plant.

Let us put some interesting facts before you. Write for full particulars.

NO. "4" FOR BIG WORK

Diameter of spindle	5
Size of hole in spindle	No. 6 Morse
Size of floor plate	8' x 12"
Floor space required	16' x 24' 6"
Weight	50,000 lbs.

No. "0" FOR PRECISION WORK

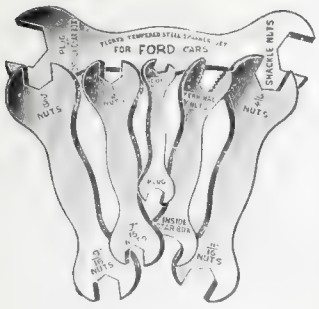
Diameter of spindle bar	3⅛ in.
Spindle bored to fit Morse Taper No.	5
Longitudinal travel of spindle	26 in.
Vertical adjustment of head on column	25½ in.
Size of table	24 in. x 50 in.
Traverse travel of table	30 in.
Longitudinal travel of table	32 in.
Approximate net weight	9,500 lbs.

Drop us a line for detailed information and catalogue.

Giddings & Lewis Manufacturing Company

Fond Du Lac, Wis.

FOREIGN AGENTS:—Canadian Fairbanks-Morse Co., Toronto, Montreal, Winnipeg, Vancouver; Fenwick, Freres & Co., Paris, Lyons, Liege, Zurich; Burton-Griffiths & Co., England; Wynmalen & Hausmann, Rotterdam; R. L. Scrutton & Co., Limited Sydney, Australia; Rylander & Asplund, Stockholm; Wilh. Sonesson & Co., Malmo; Gustav Nielsen, Christiania.



The "Ford" Spanner Set. Fits every nut on a "Ford" car. Made from a high-class THIN STEEL, skilfully hardened and tempered.

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is now in Canada on business trip



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OUR commercial manager, Mr. E. CLARKE, is visiting all the cities of note in the Dominion. You will know his movements through your local press.

He carries a full range of samples of our workmanship, both for manufacturers and novelties for the trader. Meantime we wish to familiarize you with details of Terry service.

HERBERT TERRY & SONS, LTD.

The Spring and Presswork Specialists

REDDITCH ENGLAND

ESTABLISHED 1855

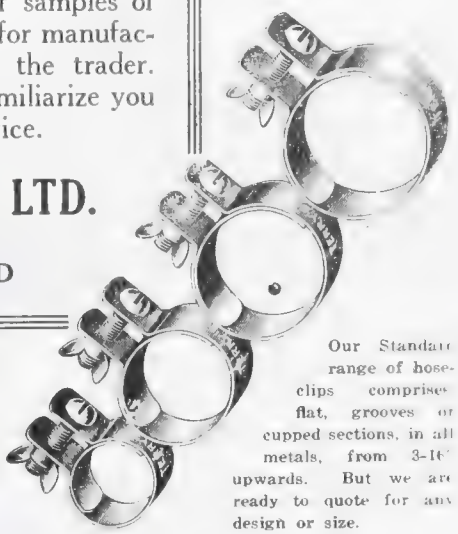


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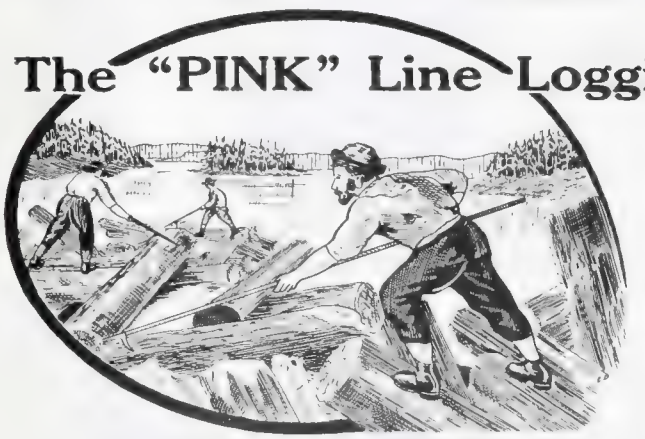


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Fifteen Tons per Day

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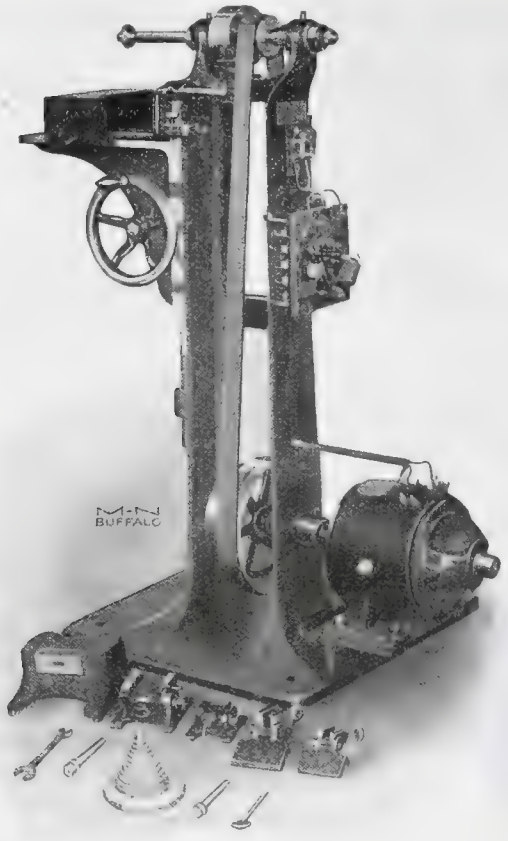
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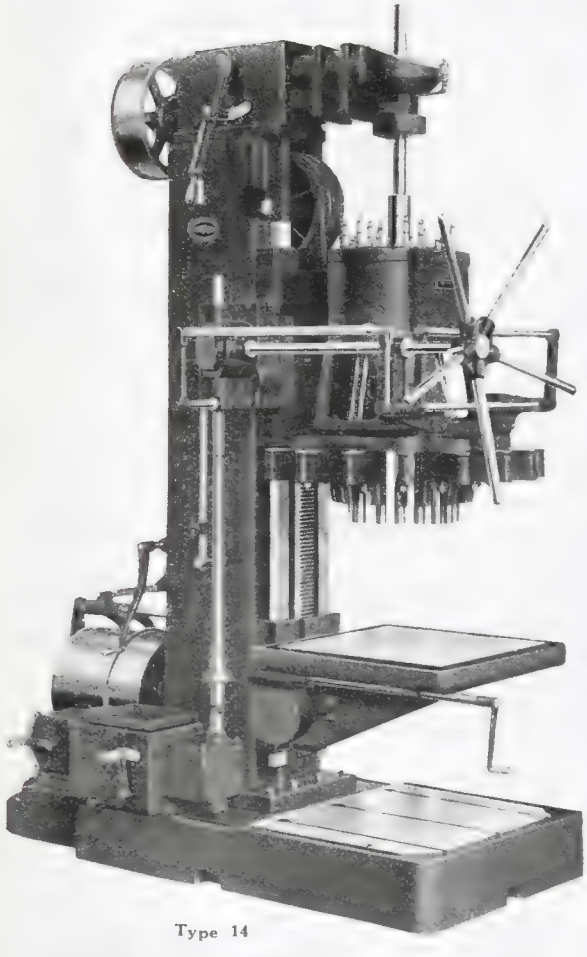
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Multi-Tappers



Type 14

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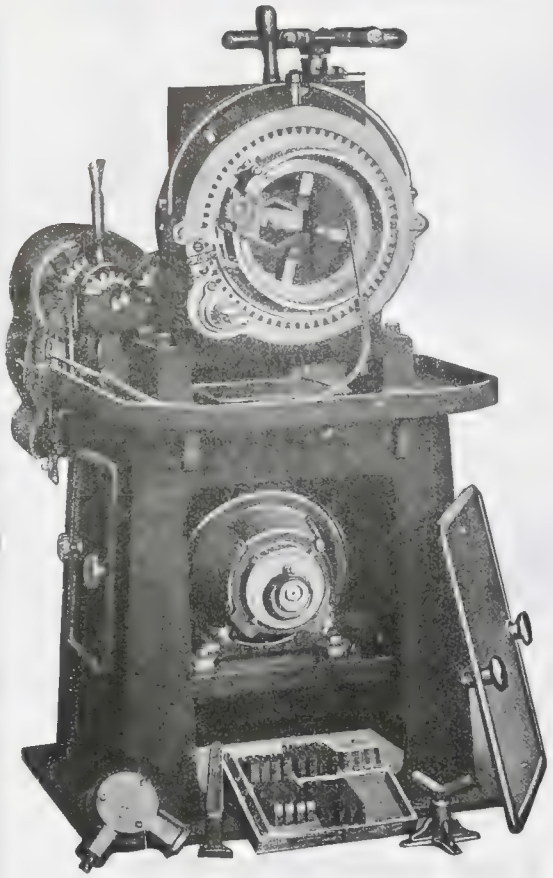
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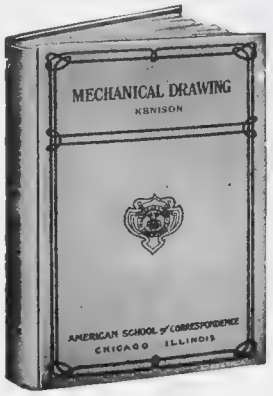
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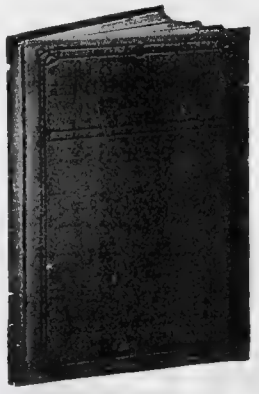
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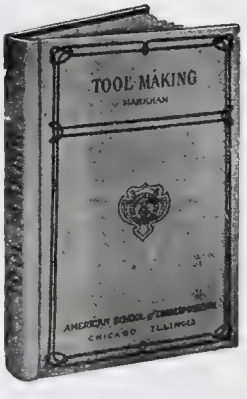
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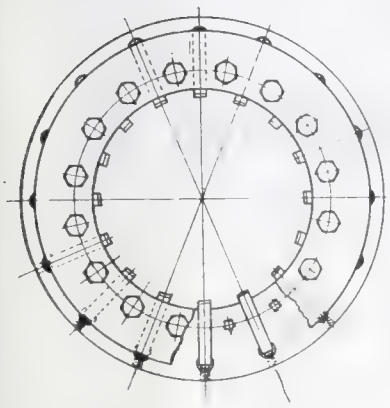
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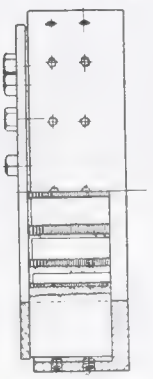
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Champfering for leading threads	5	
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Finishing cut	8	
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TOTAL TIME	27 minutes	

for two sets of chaser or 13½ minutes per set.
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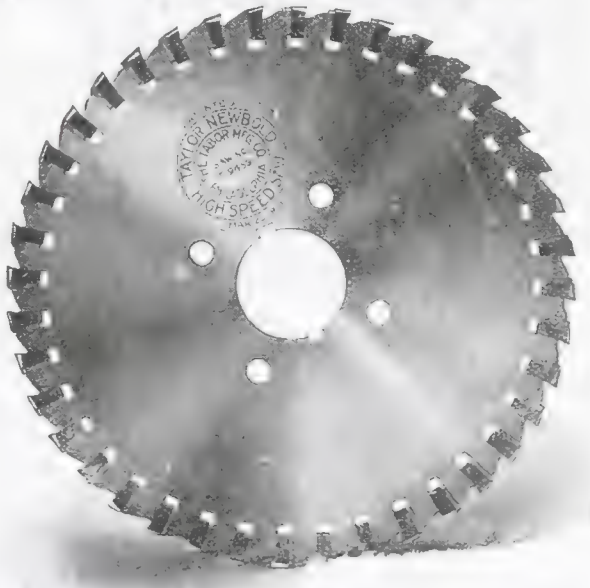
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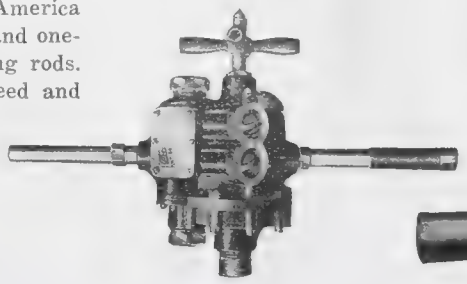
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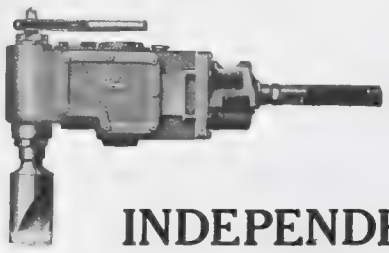
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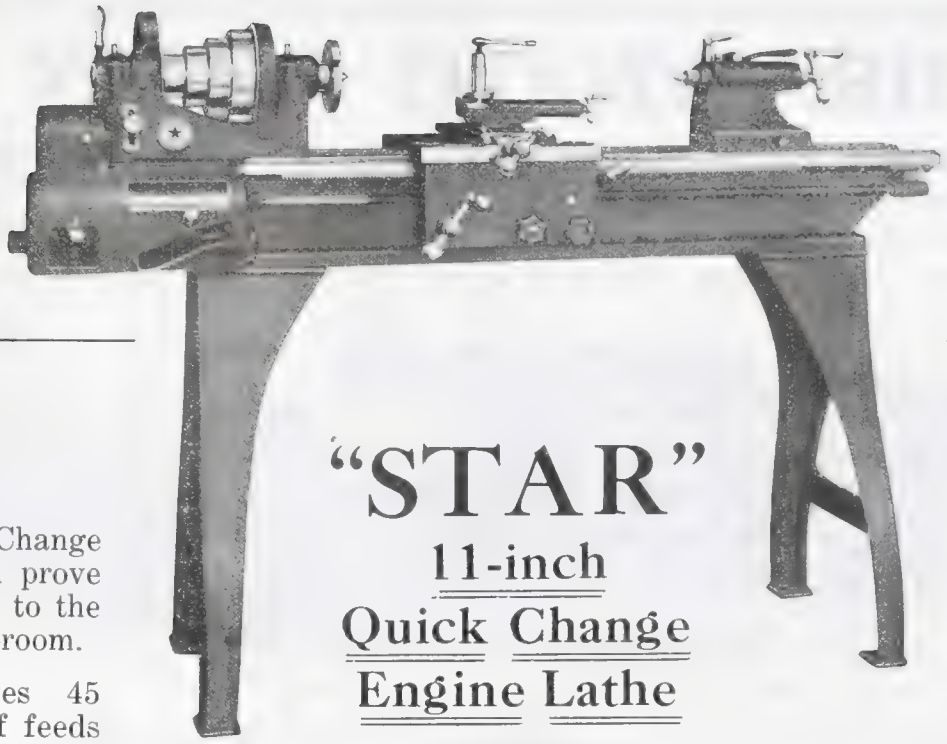
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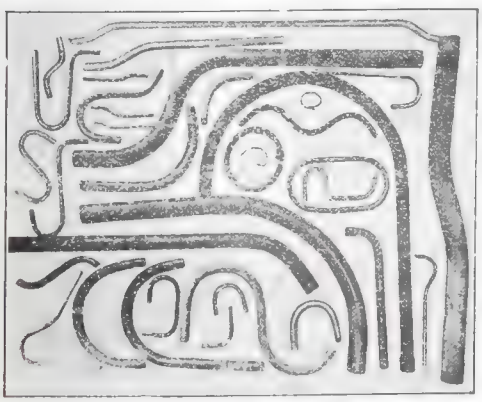
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THREE NEW MODELS
"Wonder" Pipe Bending Machines (pat.)

Electrically operated to bend from ⅛" to 20". Send for printed matter. We also manufacture TEN other sizes, hand operated benders.

American Pipe Bending Machine Company

52 Pearl Street **Boston, Mass., U.S.A.**

BRAWN TO BRAIN

Brawn, undeveloped, uncultured, means little or nothing. Brute strength never wins out.
Brain, without physical development, often withers and accomplishes little.
Add power to reasoning, brawn to brain, strength to sagacity and you have

A COMBINATION THAT WINS

So it is with a lathe. It is not only the weight, the mass, the power, but to this must be added uniformity, accuracy, efficiency. In CISCO

The Lathe With the Pull
The Lathe of Simplified Accuracy

brawn and brain are evenly proportioned. The result

A LATHE WITH NO PEER

It will save you *time, money, thought* and *worry.*

Built by

The Cisco Machine Tool Company, Cincinnati, U.S.A.

Built in 14" 16" 18" 24"

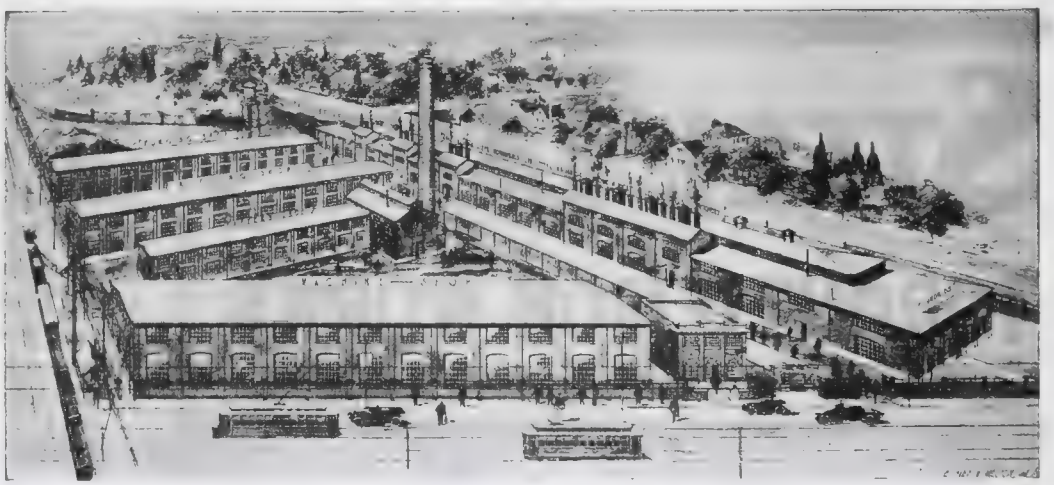
Engine and Tool Room, Belt Driven, Motor, Geared or Motor Geared.

We are Growing

When our plans are completed, "HISCO" will be the largest plant of its kind in Canada.

Two big new electric furnaces are being added to our present large equipment. And cleaning and annealing department measuring 300' x 100' is about to be completed.

This will place us in a position to handle orders big and small with unequalled facility.



Specify "HISCO" Products

Quality and Service Guaranteed

Steel, Chrome, Manganese and Nickel Steel Castings
Annealed and Unannealed

Cement Mill and Mining Machinery Castings, Stamp Mills, Crushing Plants, Excavating Outfits, Steel Car Wheels, Locomotive Driving Wheels and Frames, etc.

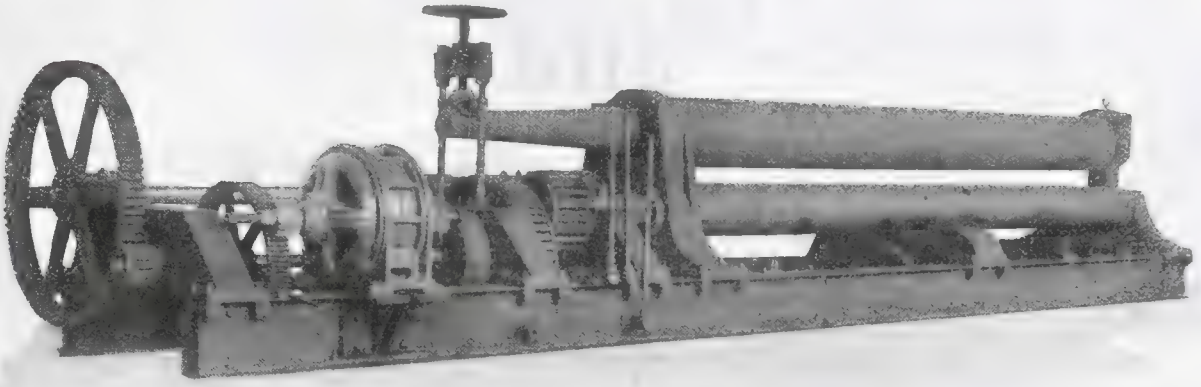
GEARS Machine Moulded, any size up to 18 feet, without Patterns

HULL IRON & STEEL FOUNDRIES, LTD., HULL, QUE.

WICKES

HEAVY DUTY PLATE BENDING ROLLS

Built for Real Service



We also manufacture High Grade Vertical Rolls, Angle Rolls, Punches, Shears, Spruce Cutters, Radial Wall Drills or Countersinking Machines, Flanging Clamps and Heavy Duty Engine Lathes.

Ask for Catalogue.

WICKES BROS., SAGINAW, MICH., U.S.A.

RICKERT-SHAFER TAPPERS

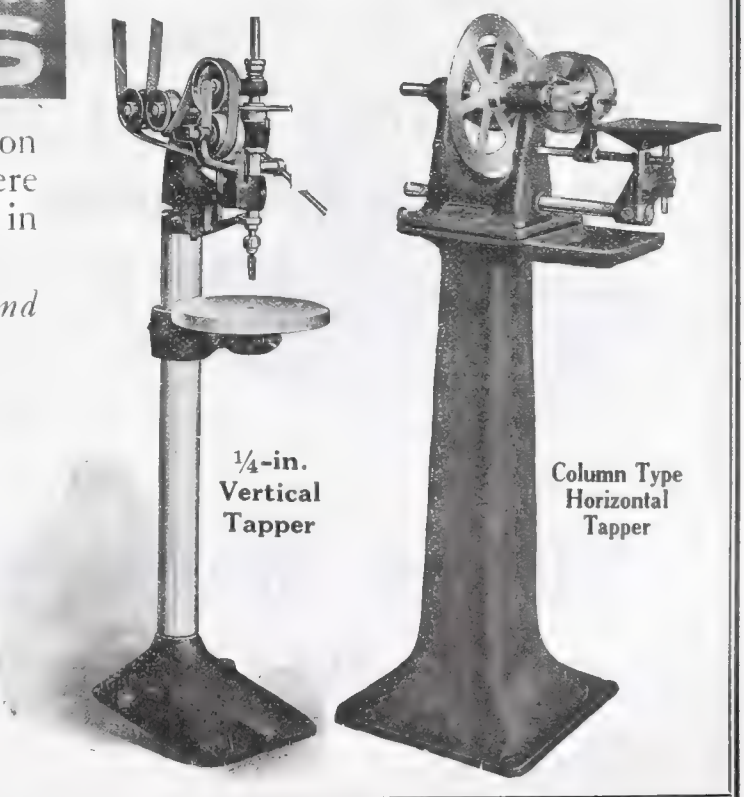
Save Tap Breakage

The *smooth drive* reduces the strain on the taps—they wear longer—and there are fewer delays from taps breaking in the work.

R-S Tappers ensure faster tapping and quicker assembling.

Friction drive, absorbing all the shock, allows a chuck speed of 140 r.p.m. on ⅝-in. work—50 per cent. faster than the usual tapping speed for that size. Uses but 1 h.p.

Write for specifications



¼-in. Vertical Tapper

Column Type Horizontal Tapper

The Rickert-Shafer Co.

ERIE, PA., U.S.A.

FRED HERBERT, Foreign Agent, Coventry, England.

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ELECTRODE WINCHES
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FOR SMELTING FERRO ALLOYS AND REFINING STEEL
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WELLAND, ONTARIO

MARTEN

MACHINE CO. HAMILTON, ONT.

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GAUGES TOOLS

MACHINES, EQUIPMENT APPLIANCES and TOOLS
for
SPECIAL PURPOSES
DESIGNED AND BUILT

We will make what YOU want as you want it.

Write us about it.

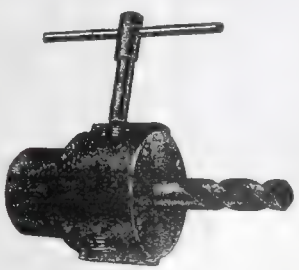
WOOD METAL PATTERNS
PATTERNS Hand and Machine

OUR REGULAR PRODUCTS:
THREAD GAUGES
SNAP GAUGES
CYLINDRICAL GAUGES

WE ARE GENERAL AND SPECIAL TOOL MAKERS

Let us quote you on your requirements, and have your tools made as you want them made.

WOOD METAL PATTERNS
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UNION

POSITIVE DRIVE DRILL CHUCKS

The Union Drill Chuck is made in seven sizes (0 to 2 inches) with PATENT TRANSVERSE SLOT—so that drills with tenons can be inserted (see illustration). The shank of drill should be squared on two sides to enter the TRANSVERSE SLOT, giving a positive rotation to the drill independently of the jaws, permitting the jaws to centre and align the drill accurately. The drill is held absolutely true and will not slip under the hardest strain. This type of chuck will be found to give the best of results on all classes of work from HIGH SPEED drilling to the hard BLACKSMITH and GENERAL REPAIR work.



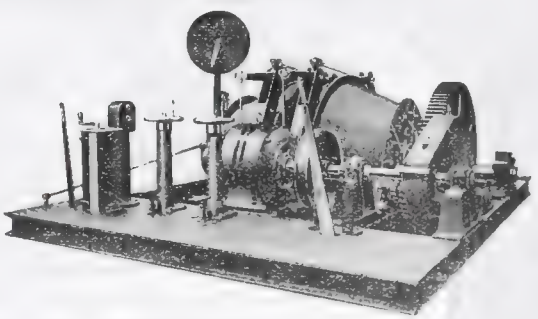
UNION
Manufacturing Co.
New Britain, Conn.

New York Office 26 Cortland St.

Makers of a complete line of chucks

LANCASHIRE MOTORS

HAVE WORLD WIDE REPUTATION
FOR
"RELIABILITY"



MOTOR DRIVING MINE HOIST

Specialists in Motor Manufacture and Application

SEND YOUR ENQUIRIES TO

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Williams' Superior Drop-Forged Clamps

FOR nearly half a century we have been making and finishing *Superior* drop-forgings. The experience gained in producing hundreds of thousands of parts to the most exacting requirements has enabled us to develop several lines of Clamps which are unsurpassed in stiffness and strength. All are made of a strong, tough grade of carefully selected steel and after forging are "heat-treated" to improve their stiffness and strength just as are the more important airplane and automobile parts. Remember, "There's a Williams' Clamp for every purpose."

Ask for Machinists' Tools Booklet showing Machinists' Clamps, "C" Clamps, Strap Clamps.

J. H. WILLIAMS & CO.

"The Drop-Forging People"

45 Richards St. - - Brooklyn, New York

THE A. G. LOW CO., LTD.
45 Pacific Ave., Saskatoon, Sask.
Agents for Manitoba, Saskatchewan, British Columbia and Alberta

PUNCH PRESS WORK

What Can You Save?

By Using Parts Made in the Punch Press

Look over your standard parts, Mr. Manufacturer, and see what parts can be made (or could be made by slight change in design) by this process.

You will be surprised at the saving you can effect.

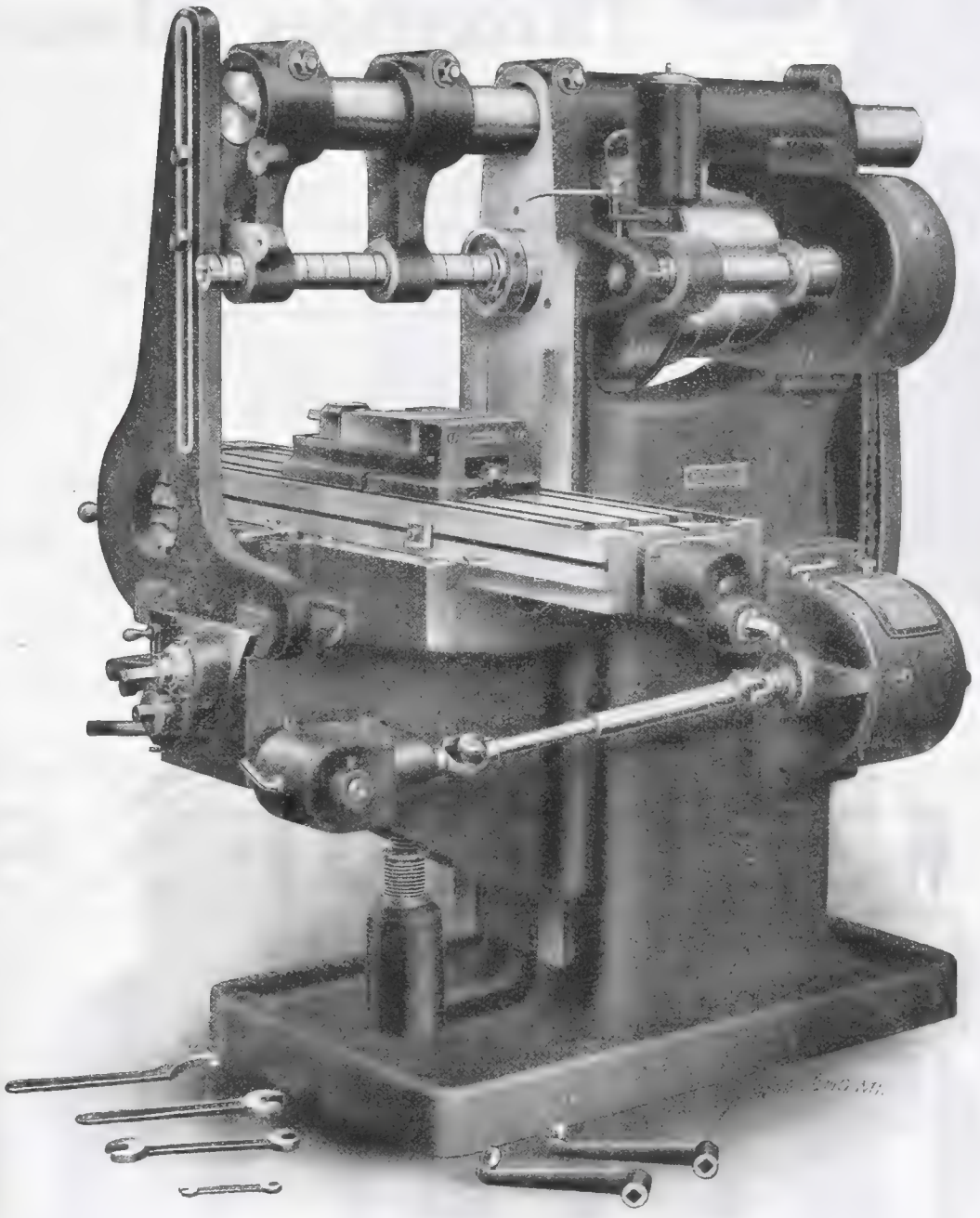
We make Blanking, Perforating, Drawing, Forming and all classes of dies and tools for plain or difficult stamping to suit the production required.

A Battery of presses is also available at our plant to manufacture parts for you with the understanding that you pay only for good parts made. Our facilities ensure prompt deliveries at right prices.

W. H. BANFIELD & SONS LTD.

370-386 PAPE AVE., TORONTO.

KEMPSMITH



KEMPSMITH No. 3 Plain Milling Machine

Double Back Geared.

A heavy, powerful tool with double back gears and wide driving belt running on a three-step cone of large diameter. Our Catalogue "B" describes and illustrates many notable features of the Kempsmith Miller. Write for a copy to-day.

THE KEMPSMITH MANUFACTURING CO.

MILWAUKEE, WIS., U.S.A.

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"The Marshalltown Throatless Shears"

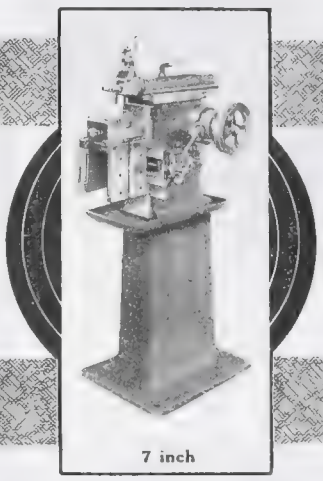
guarantees perfect work at less than half the ordinary expense.

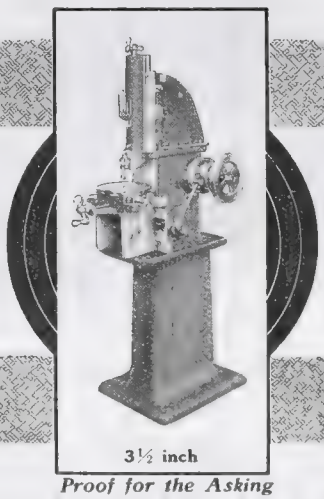
Rotary, self-feeding shears designed for cutting in and out curves, straight or irregular shearing, circles, also beveling and splitting of plates. Built in various sizes having capacities from tin up to ½" thick. No limit to the size of sheet being cut. Hand, belt or motor drives. The last word in metal cutting shears. We also manufacture Rotary Bevel Shears, Splitting Shears and Plate Milling Machines.

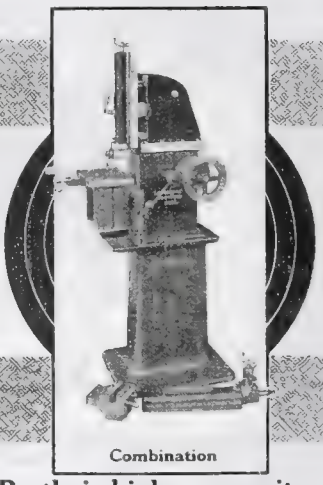
Let us know your requirements.

Marshalltown Mfg. Co.
Marshalltown, Iowa
U. S. A.

RHODES


7 inch


3½ inch


Combination

Machines of increased efficiency increase the production rate of your men, offsetting an increase in wage rate.

Proof for the Asking

THE RHODES MFG. COMPANY

Owned and operated by the Jacobs Mfg. Co.
HARTFORD, CONN., U.S.A.

By their higher capacity and wider range of service, RHODES, Improved Shaping and Slotting Machines multiply output and correspondingly cut costs.

Photographic Copying The PHOTOSTAT

(Reg. U. S. Pat. Off.)

"The idea of copying by means of a camera at first caused us to raise our hands in astonishment—the complexity of photographing to produce copies and the possible expense of such a method made it seem out of the question.

"How soon our prejudice, which amounted to nothing but ignorance, was overcome when 4 months ago we installed a photographic copying machine—the Photostat, to make photographic copies of typewritten work, drawings (simple and structural), and machinery!

"With this device we can either enlarge or reduce typewritten work, produce copies of drawings which are difficult and sometimes impossible to blue print, and secure photographs of different parts of machinery, a copy of which we may want to send to customers or prospective customers.

"The machine is so simple to operate that a girl with no previous photographic experience handles it—the copies are clearer than any other known means of copying; of course, there is no possibility of error—and, as an example of its remarkable speed, where it would take us a half hour to produce a copy of our 'Suggestion Prize Awards' we did it in 5 minutes with the Photostat."

—Minneapolis Steel & Machinery Co.



This cut shows a PHOTOSTAT on which a large drawing has just been copied in less than a minute.

Never Makes a Mistake

It is simple, practical, easy to handle. Requires no expert knowledge. The machine is loaded with a roll of sensitized paper especially manufactured for the purpose.

The original subject is photographed directly upon this paper producing a facsimile copy which is immediately cut off, developed and fixed right in the PHOTOSTAT itself.

The focusing, exposing and developing are all controlled by simple mechanical devices and no glass plate, film or other intermediate negative has to be made.

After fixing, the copy is removed to a tank of running water and rapidly washed free from chemicals. It is then dried and is ready for use. As many copies as desired may be run off in this manner.

By a simple adjustment of the mechanical focusing device the copy may be made at actual size, reduced, or enlarged, within the size limitations of the machine.

Error in copy is impossible because every copy is an absolute facsimile. The operations are all simple, such as a boy or girl can do.

The PHOTOSTAT Copies

Pencil Drawings, Ink Drawings,
Tracings, Reports,
Shipping Lists, Data Sheets,
Contracts Ledger Pages,
Illustrations for Salesmen, Insurance Records,
Sketches Blue Prints,
Letters, Maps,
Legal Documents, Graphs,
Specifications, Cuts and Drawings for Advertising, etc.

Manufactured by the Eastman Kodak Company exclusively for the

COMMERCIAL CAMERA COMPANY

343 STATE STREET, ROCHESTER, N. Y.

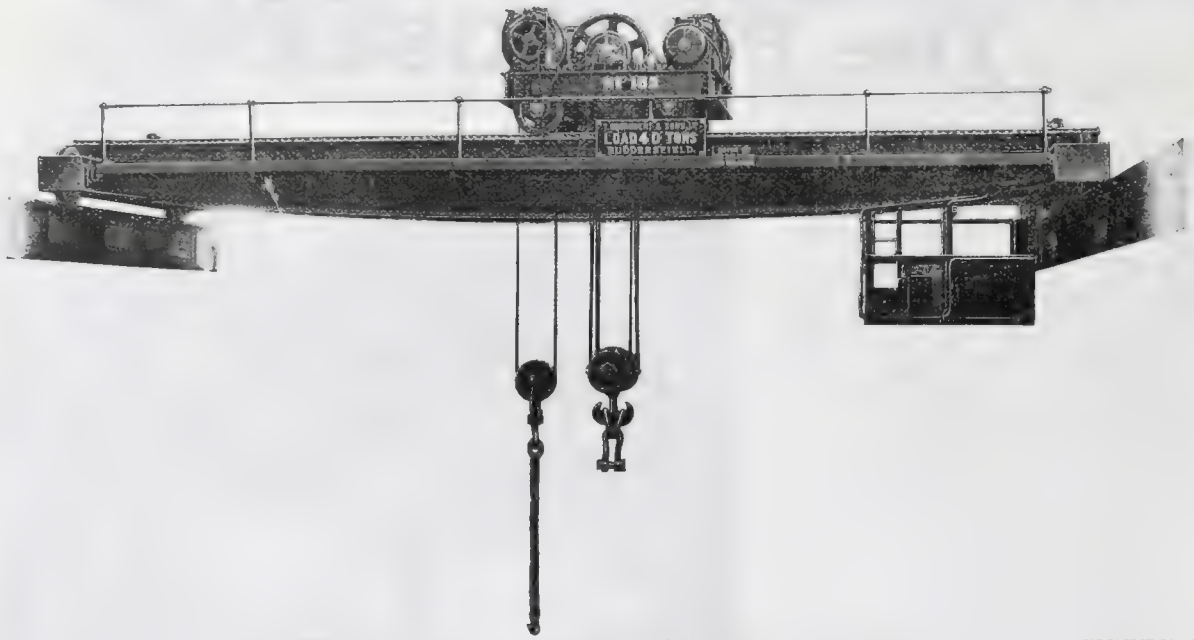
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THOMAS BROADBENT & SONS LIMITED

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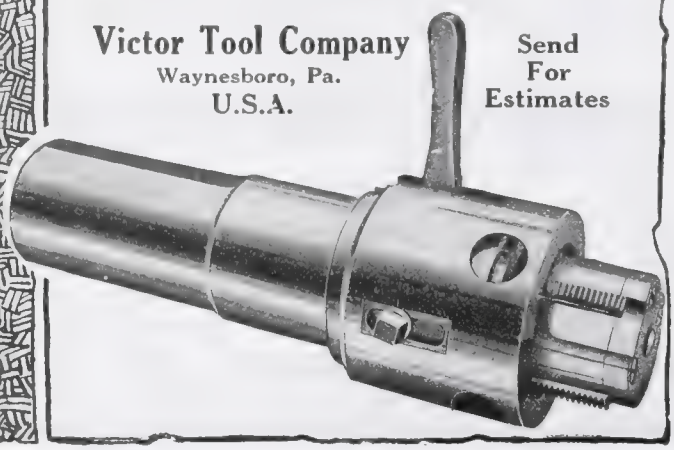
We wanted something original— this is what we got

"BOTH in these operations and half another — I'll show you later — completed in the time our old taps took to do one; that, I guess, is why we continue to use your Victor Collapsible Taps."

It was the often-heard story of time saved, of costs lowered, of all threads clean and smooth. And it was pleasant to hear.

Victor Tool Company
Waynesboro, Pa.
U.S.A.

Send For Estimates



DIAMOND TOOLS

FOR TRUEING GRINDING WHEELS

QUALITY SERVICE SATISFACTION

INDUSTRIAL GEMS

THE GENERAL SUPPLY COMPANY of CANADA, LIMITED

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VANCOUVER 906 Vancouver Block

Sole Canadian Agents for

THE JOYCE-KOEBEL COMPANY, INC.
Formerly Geo. A. Joyce Co. Ltd.

NEW YORK LONDON

Save Taps, Trouble and Money

The "B-T" Reverse Tapping Attachment fits any make drill press and is equally efficient on **all** of them.

Eliminates necessity of reversing the machine spindle. Simply raising spindle reverses tap—the machine, meanwhile, goes ahead at full forward speed.

A reverse speed twice that of tapping speed is given by an internal gear drive. It is friction driven—automatically adjusted by the amount of pressure the operator puts on the drill spindle.

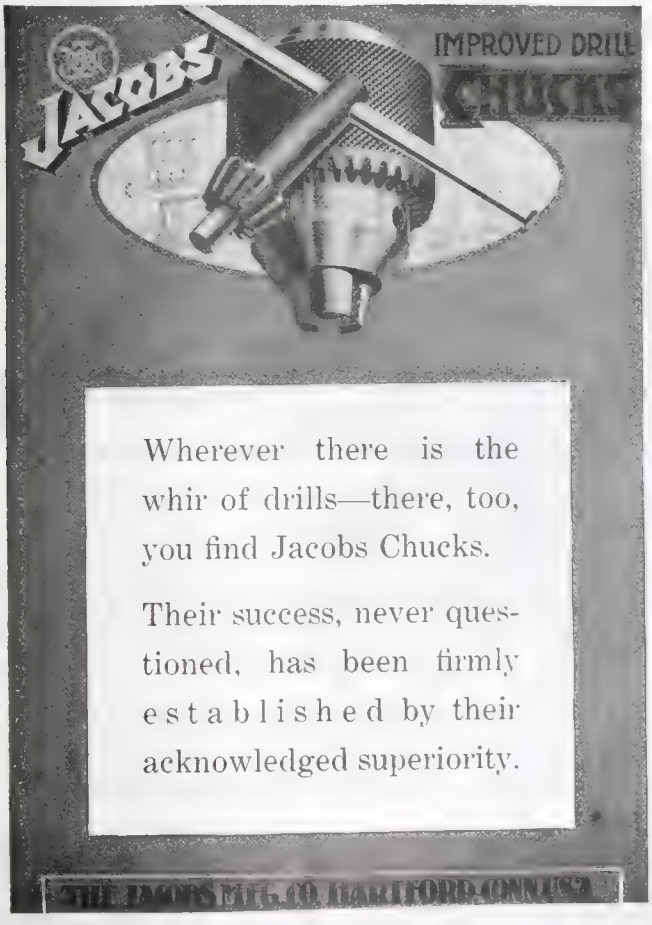
Can also be had with positive drive. Both plain and friction chucks are fitted with jaws to grip round and square end of tap.



Get the details—In our Bulletin.
Write to-day.

Bicknell Thomas Co.
Greenfield, Mass., U. S. A.

"B-T" Reverse Tapping Attachment



H & G

Die Head Cuts
Perfect Threads

The H. & G. Die Head illustrated is only 3⅝" outside diameter, yet it will cut from the smallest up to 1" standard thread and up to 1⅛" fine threads. For absolute proof of its ability to stand up and give good results, see the perfect threads it cuts on nickel steel. You can see these many places, but in almost any automobile or aeroplane plant for certainty.

Made in 9/16", 1", 1½" and 2" sizes.

No stronger, more durable, more accurate Die Head was ever made.

on Nickel Steel



Ask for Catalog

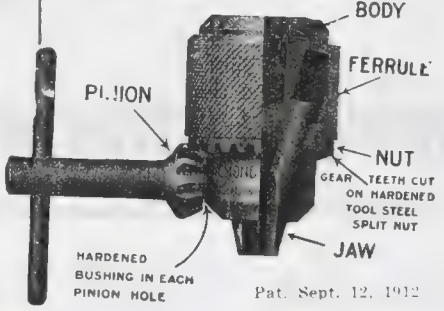
Eastern Machine Screw Corp.
New Haven - Conn.

ALMOND
CHUCKS & MICROMETERS

Give them a try out. Universal Geared Scroll Chuck—Sizes 5", 6", 7½", 9" and 12".



Geared Nut Drill Chucks, in various capacities, 0" to 1".

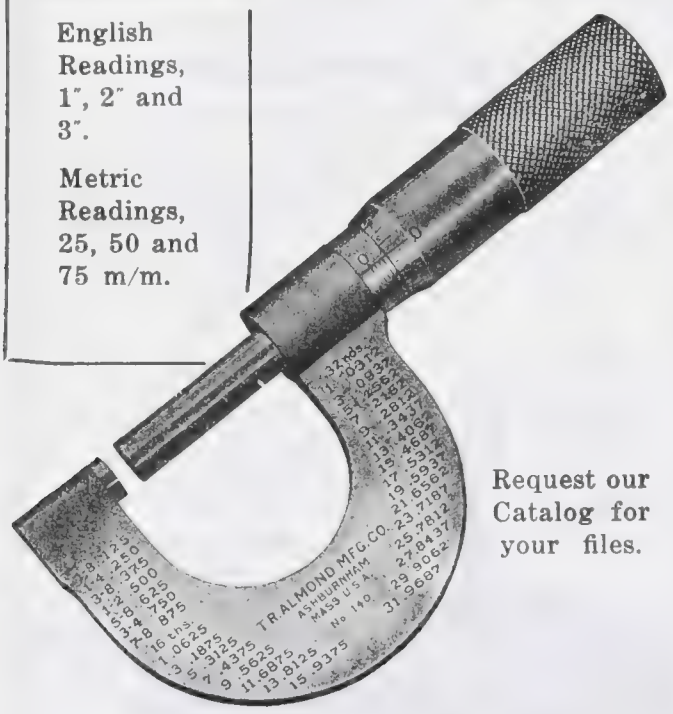


Pat. Sept. 12, 1912

Micrometer Calipers—

English Readings, 1", 2" and 3".

Metric Readings, 25, 50 and 75 m/m.

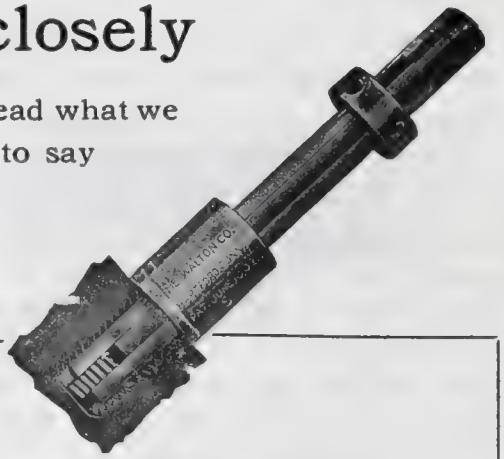


Request our Catalog for your files.

T. R. ALMOND MFG. CO.
6 Maple Avenue, Ashburnham, Mass.

Look at this again —closely

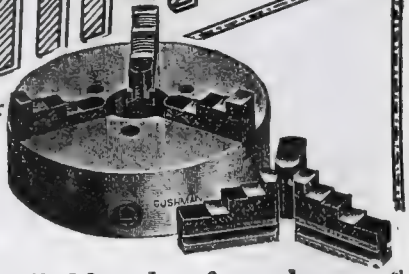
and read what we have to say below



WHEN a tap breaks off close or below the surface, you'll find this Walton Tap Extractor will save a great deal of time and trouble. The crucible fingers grasp the flutes of the tap, a twist of the wrench and the piece is out.
Don't you think it would pay to have a few lying around on your benches?

The Walton Company
Hartford, Conn.

Cushman



The "Cushman" Chuck of to-day is the fruit of nearly sixty years of Chuck building

And right from the start in 1862, they have been known throughout the industry for their high quality Material and Workmanship.

The CUSHMAN Chuck of to-day embodies every up-to-date improvement of a long line of FAMOUS CHUCKS.

Send for our Catalogue showing complete line of Lathe Chucks, Drill Chucks and Portable Face Plate Jaws.

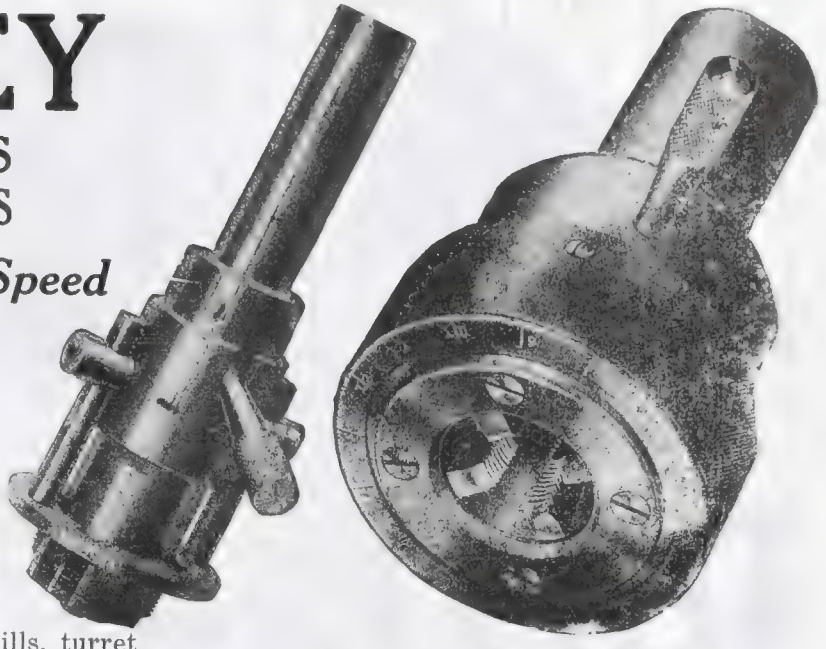
Cushman Chuck Co., Hartford, Conn.

CHUCKS

MURCHEY

COLLAPSING TAPS and SELF-OPENING DIES

Promote Accuracy and Speed



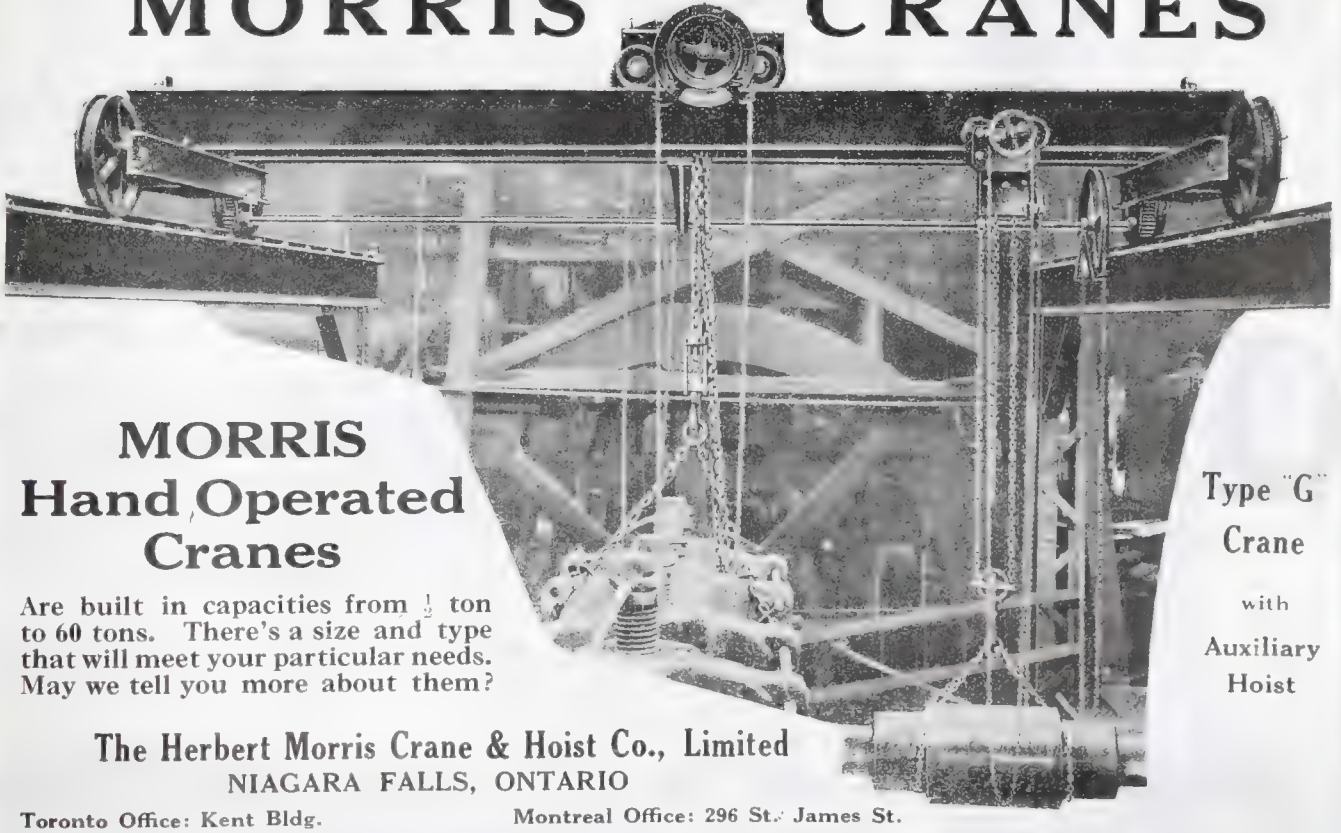
MURCHEY Collapsing Taps and Self-Opening Dies are cleared free from the thread instantly, preventing all danger of stripping, besides cutting time for production in half. **Thus you are sure of greater accuracy and greater production.** Murchey Tools are speeding production in all parts of the country on tapping machines, drill presses, monitor machines, boring mills, turret lathes, and on all other machines to which taps or dies may be attached.

Let us know the class of work you are handling and we will show you how to increase your production 50 per cent. without running up the eost.

Murchey Machine & Tool Company, Detroit, Mich.

THE COATS MACHINE TOOL CO., Caxton House, Westminster, London, England, Glasgow, Newcastle-on-Tyne.
FENWICK FRERES AND CO., 15 Rue Fenelon, Paris, France.

MORRIS CRANES



MORRIS Hand Operated Cranes

Are built in capacities from ½ ton to 60 tons. There's a size and type that will meet your particular needs. May we tell you more about them?

Type "G" Crane with Auxiliary Hoist

The Herbert Morris Crane & Hoist Co., Limited

NIAGARA FALLS, ONTARIO

Toronto Office: Kent Bldg. Montreal Office: 296 St. James St.



They're the happy result of a great combination of specially trained men and the finest special machinery—these Butterfield carbon and high-speed steel Twist Drills, Gear and Milling Cutters, Side Mills and End Mills, with straight or spiral flutes and plain or nickeled teeth. Their ability to serve accurately and long equals that of Butterfield Taps, Dies and Reamers — the sincere praise of a thousand users wouldn't be a better recommendation.

The Butterfield Catalog, just off the press, fully describes these better tools and how they increase production. Write for your copy.

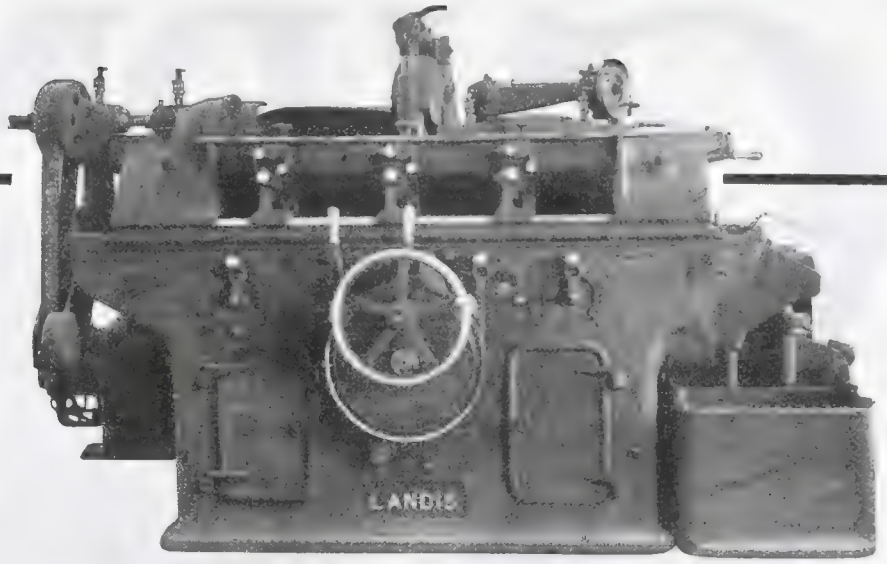
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Butterfield & Company, Inc. - Rock Island, Quebec

Toronto Office: 220 King Street West

LANDIS

Plain
Self-contained
Grinding
Machine



You Can't Afford to Overlook These LANDIS Features

Work Table Stationary. The Landis principle of having the work table stationary secures it firmly on the bed.

Overhang Eliminated. The Landis Grinding Wheel Head, in its travel, never goes beyond the length of the bed. The Landis Grinding Wheel Head is directly above the carriage and supported between the wide, well set apart, carriage ways.

Downward Belt Pull. The wide, powerful, endless grinding wheel belt pulls directly back and down from the wheel spindle, tending to secure the base with the bed.

Our catalog gives complete data and specifications of various types of Landis Grinding Machines.

LANDIS TOOL CO., WAYNESBORO, PENN.
50 Church Street, New York City

ARCTIC METAL

Our long and extensive experience in the manufacture of **Brass, Phosphor Bronze, Copper** and **Aluminum Castings** enables us to supply a casting of a special formula for any purpose.

Tallman Brass & Metal Co.
HAMILTON, ONT.

U.S. MILLER

Reduce Your Milling Costs ⅓ to ½

Don't use a big machine for milling small parts! By adopting the U.S. MILLER you can do the work just as efficiently and at a greatly reduced cost — as much as 1/3 to ½ lower.

The U.S. MILLER stands alone in its class for capacity, accuracy and speed.

Write for the full details.

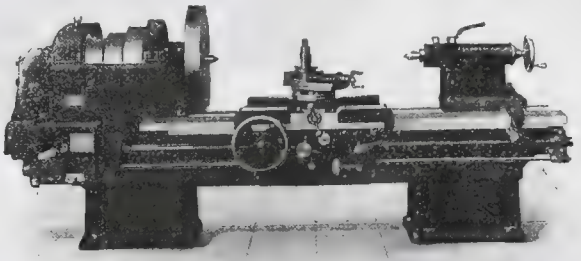


United States Machine Tool Co.
CINCINNATI
Ohio U.S.A.

SIDNEY

Sidney for Service

Sidney-for-Service Lathes are noted for their power and rigidity. Take deep cuts through toughest metal without pause or chatter.



Specifications include 3-step cone, double back gear, semi-quick change gear lathe, built on 10 ft. bed. This lathe also furnished with quick-change gears. Bed lengths available: 10, 12, 14, 16, 18 and 20 feet.

The Sidney Line comprises 15-inch, 17-inch, 19-inch, 25-inch, 27-inch, 30-inch and 36-inch lathes, which are adaptable to the finest tool room work or the heaviest duty shipyard or factory rapid production work.

Heavy Duty Engine Lathes

The Sidney Tool Company, Sidney, Ohio

Canadian Agents: The Geo. F. Foss Machinery & Supply Co., Montreal, Quebec. H. W. Petrie, Limited, Toronto, Ontario.



The Greenfield Universal Grinder

For General Tool Room Work

This Grinder is furnished with attachments for grinding all sorts of milling cutters, reamers, counterbores, and other machine shop tools.

It is also suitable for cylindrical, internal and flat work which frequently turns up in the making of tools and jigs.

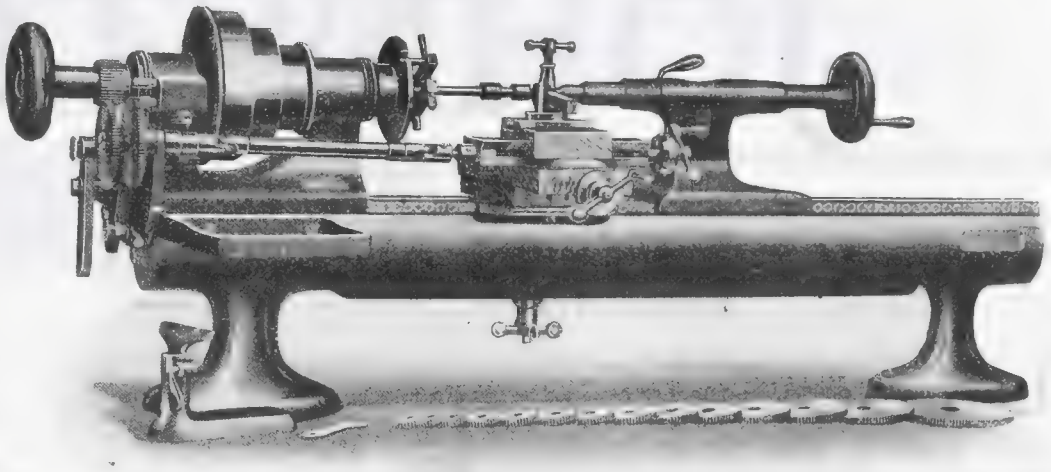
These attachments are all very simple in design and easily adjusted upon the machine, being graduated so that any desired angles can be at once obtained.

The whole machine is thoroughly well built, well finished, and will be found a dependable, convenient grinder.

Greenfield Machine Company,
GREENFIELD, MASS., U.S.A.

CATARACT BENCH LATHES AND ATTACHMENTS

Cataract Bench Lathes are finely constructed precision tools, with responsive controls, simple adjustments and numerous convenient attachments adapting them to a wide variety of work. **Study this illustration.** Note the base, the circular bed, the sliding tool post, massive head stock (indicating strength), range of gears, special tailstock, arrangement of gears.



Hardinge Bros., 1770 Bertau Avenue, Chicago, Ill.

ALFRED HERBERT CO., Limited, Coventry, England, are our representatives for United Kingdom, France, Belgium, Russia, Japan, Manchuria, Korea, Formosa, China, Italy.

Wherever Pipe is Cut or Threaded Economically

The probability is two to one that it's a

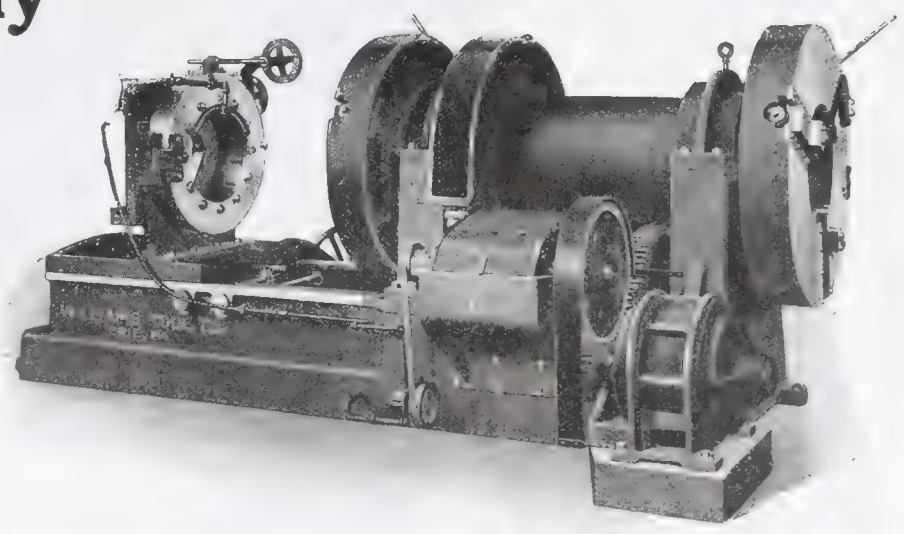
Williams Pipe Machine

that's on the job.

For in approximately two-thirds of all the larger plants in this country Williams' Pipe Machines are used.

It was the Williams Pipe Machine that brought highest honors home from the Panama Exposition.

The Machine illustrated has a capacity of 21½" to 12". Also nine other sizes to meet your requirements.



Write

Williams Tool Company

Erie - Penn. - U.S.A.

Canadian Agents:
The A. R. Williams Machinery Co., Limited Toronto, Canada

European Agents:
Universal Machinery Corp. London, - England

POTTER & JOHNSTON

AUTOMATIC MILLING MACHINES

HORIZONTAL VERTICAL

EVERY working part of this machine is built with a view to **increased production.**

CONTINUOUS MILLING

No lost time due to machine idleness because the operator is loading one fixture while the cutter operates on the other.

16 Table Feeds, 7/8 in. to 12 5-16 in.

Length of Table Feed, 28 inches. 12 Spindle Feeds, 20 to 180 R.P.M.

Send us your Blueprints and we'll gladly give you production figures.

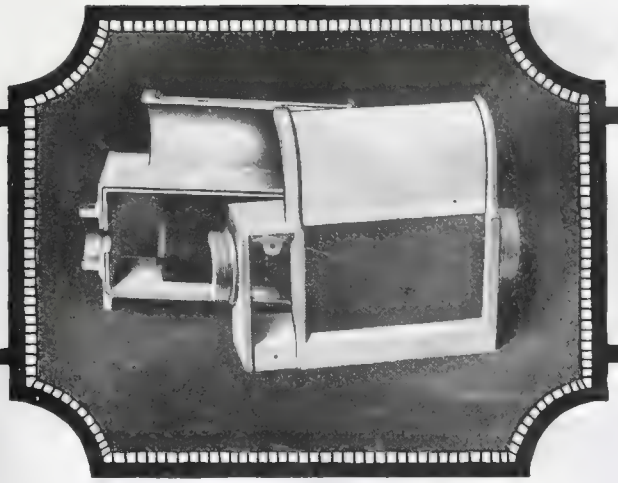
Bulletin 36 on application.



Canadian Offices: POTTER & JOHNSTON MACHINE CO., Pawtucket, R.I.

ROELOFSON MACHINE & TOOL CO., LTD.

Head Office: 1501 Royal Bank Building, Toronto, Canada
Works and Warehouse: Galt, Ont., Canada



FRANKLIN
DIE-CASTINGS

Reducing Costs—

To reduce the cost of your product without increasing your investment—use Franklin die-castings instead of machined parts.

Good die-castings not only are less expensive—they are more uniform, more quickly assembled, and often two or more parts can be cast together at a very decided saving.

Twenty-seven years' intensive experience has taught us how to make the *best* die-castings how to apply them most satisfactorily to a wide range of purpose.

Send samples or blue prints for recommendation and estimates. And ask for Booklet "C."

Franklin Manufacturing Co., 746 Gifford St., Syracuse, New York

Every Emery Wheel With Its Own Dresser



Desirable, isn't it, now that cost is no objection? For with an inexpensive Desmond-Stephan Dresser for every wheel, every wheel will be touched up frequently and so kept true and equal to its original cutting efficiency.



For all ordinary shop grinding wheels specify **"Diamo-Carbo"**—the perfect diamond substitute.

For large, coarse, hard wheels ask for the **"Desmond-Huntingdon."**

Sherman Corrugated, 2 sizes
Norton Zig-Zag, 2 sizes
Magazine
Diamonds

The Desmond-Stephan complete line of Economical Grinding Wheel Dressers is catalogued. Write for copy.

The Canadian Desmond-Stephan Mfg. Company
HAMILTON, ONTARIO
Alfred Herbert, Limited, Coventry, Agent for Great Britain

Special Equipment
Built to Specification
Steel Plate and Structural Steel Work

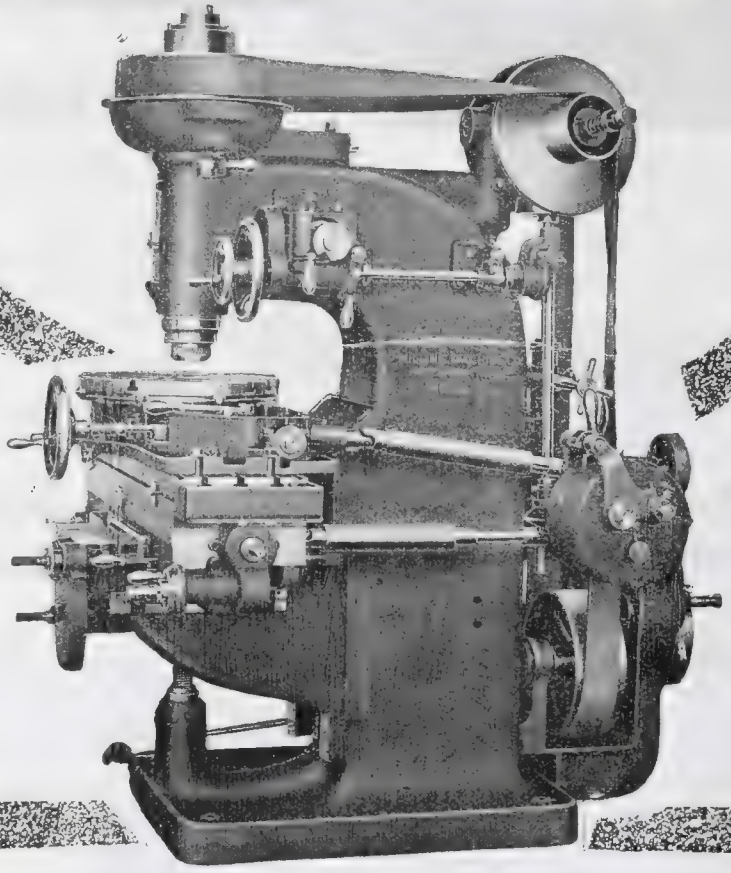
Grey Iron Castings

High Quality and Prompt Service Double-Sure

Write for Full Particulars

WILLIAM HAMILTON CO., Limited
TORONTO - ONTARIO

Becker



"Becker Belt Driven Millers"

The Machine that gives the Smooth Finish

Model B

The machine shown above is a Becker Model B Belt Driven Miller — Like the other machines of this line it is a Production Tool of the first class, embodying all the features that have made Becker Millers the standard.

The strenuous period of war work has introduced Becker Belt Driven Millers into Canadian factories. They were essential then because they greatly increased production without adding to manufacturing costs—and now, they are essential also because they will enable you to reduce your manufacturing costs in order to cope with the keen after-war competition.

You need a Becker Belt Driven Miller.

Write for Circular O-501—*NOW*

BECKER MILLING MACHINE COMPANY

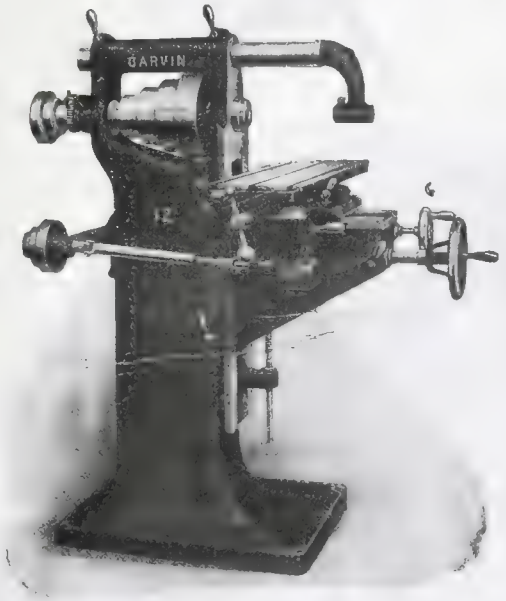
Hyde Park, Boston, Mass.

Canadian Agents:

Rudel-Belnap Machinery Company, Ltd., 137 McGill St., Montreal.

A. R. Williams Machinery Company, Ltd., 64 Front St. West, Toronto.

GARVIN



No. 12 Plain Milling Machine-Use Code Abrade

NO. 12 PLAIN MILLING MACHINE

FOR ALL LIGHT MANUFACTURING

This machine is built especially strong and substantial for a tool of its capacity, and has many valuable features worthy of special mention. The slide is fitted with a quick pitch screw, giving one inch per turn. This combines the rigidity of a rack feed with the steadiness of the screw feed. The table has an oil pan all around it, with finished edges—automatic feed, trip and reverse—adjustable nut on the feed screw to take wear—the Feed Screw is hardened.

Adjustments**18 x 6 x 15 in.**

For Further Information ASK YOUR DEALER or WRITE US DIRECT

IMMEDIATE DELIVERIES

Send for Complete Catalog

Manufactured by

THE GARVIN MACHINE COMPANY

Spring and Varick Streets (*Visitors Welcome*) **50 Years New York City**

Production of Rare Quality at Lowest Labor Costs



There is unusual strength, accuracy, speed, convenience and range in

AURORA

Drilling Machines

You can use them to great advantage on any work in your shop that's suitable for a machine tool of this kind. The operation is easy and the labor cost comparatively low.

Drop a line for full particulars and specifications.

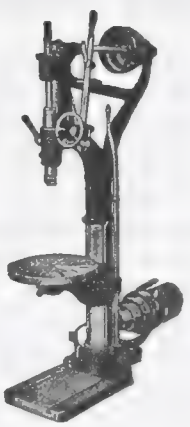
Stationary Head Sizes 20"—21"
Sliding Head Sizes 22"—44"

The Aurora Tool Works

AURORA, INDIANA, U.S.A.

The BARNES DRILLS

TRADE MARK



Complete line. 8-inch to 50-inch swing

Gang Drills.—Horizontal Drills.

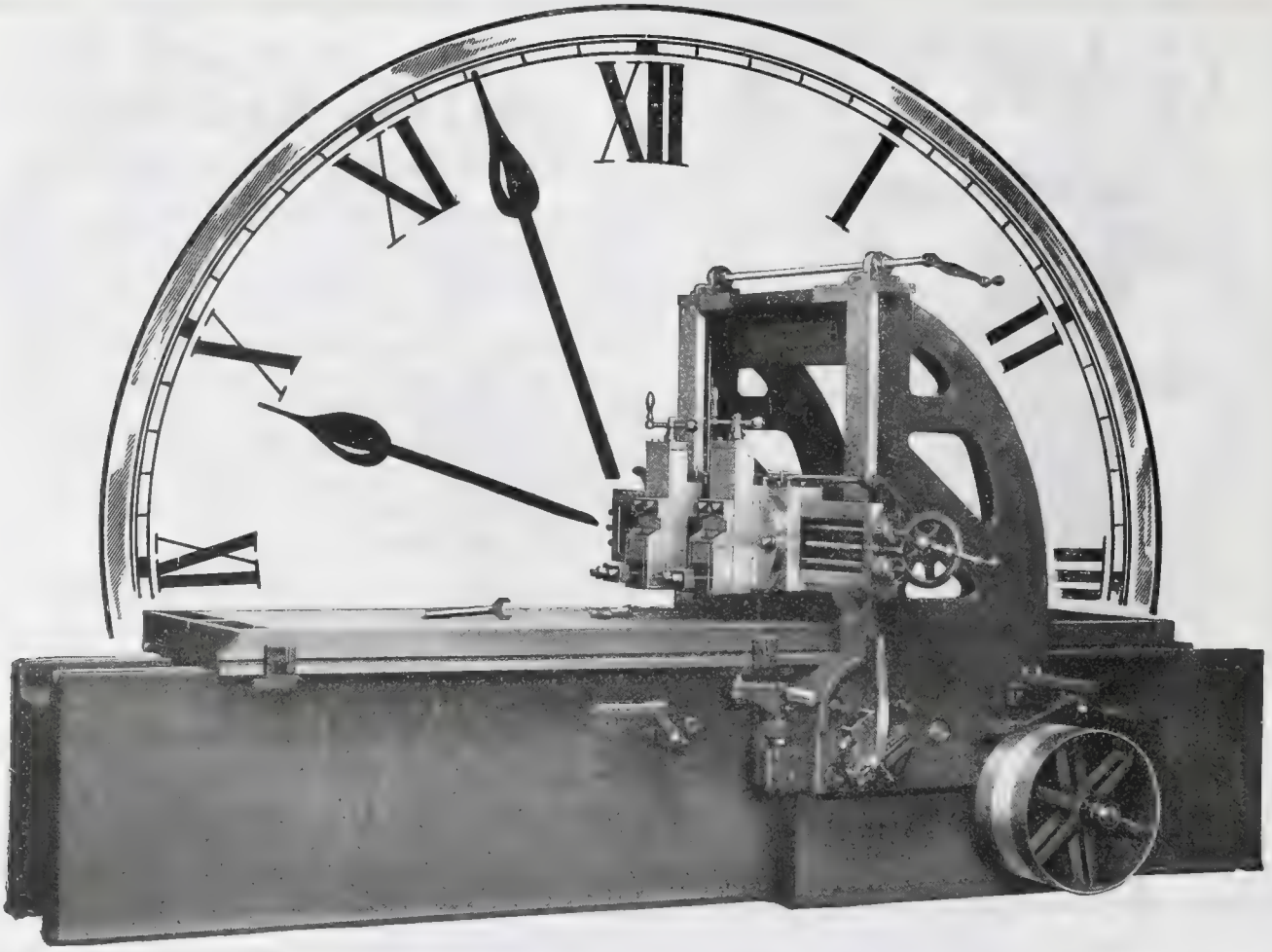
SEND FOR CATALOG.

W. F. & JOHN BARNES CO.

104 Ruby Street - ROCKFORD, ILL.

Canadian Agents—A. R. WILLIAMS MACHINERY CO. Toronto, Winnipeg, Vancouver, and St. John, N.B.

WILLIAMS & WILSON, Montreal



The Advantage of the Second-Belt Drive Becomes More Evident as Time Goes on

In the construction of Whitcomb-Blaisdell Planers the usual rapid running train of gears is eliminated. This means the absence of shocks and jars, and not only assists in turning out smooth, finely finished work—work that is free from chatter marks—but actually prolongs the life of the planer.

The substitution of the second belt drive for the usual train of spur gears **reduces noise and friction losses.** More power is delivered to the table, and there is a noticeable lack of "chatter." The "cushioned" reverse of the Second-Belt Drive permits the **exceedingly high table speeds** that would rack to pieces the ordinary full-geared planer.

THE IDEA BACK OF THE WHITCOMB-BLAISDELL IS THE BEST RESULTS IN THE SHORTEST TIME.

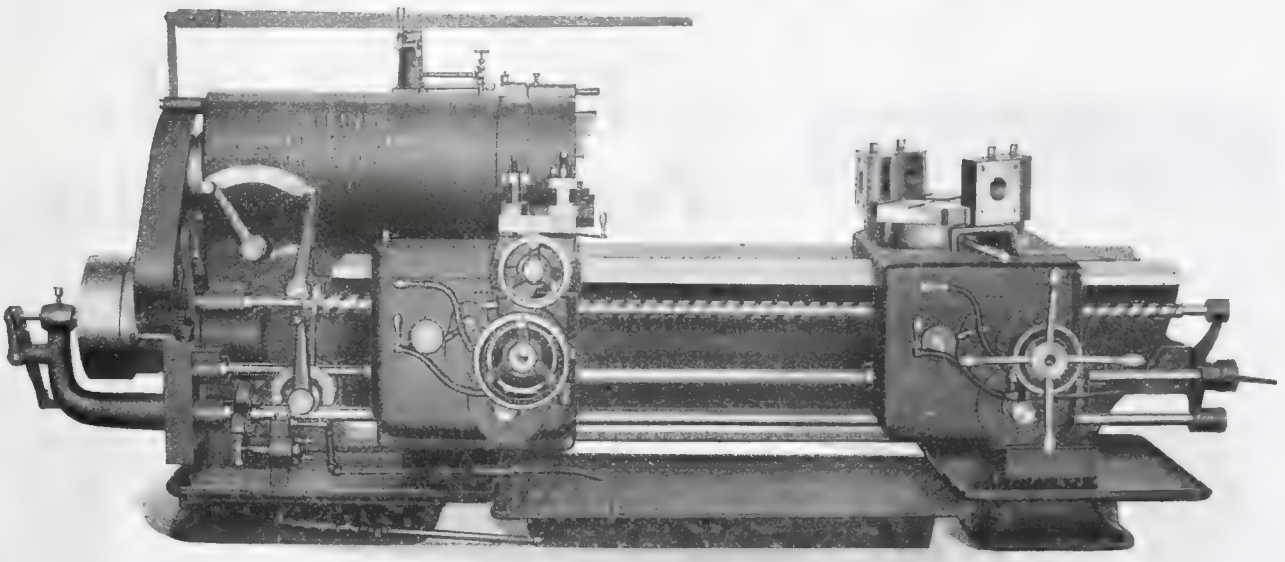
Why not investigate? May we send catalog?

WHITCOMB-BLAISDELL MACHINE TOOL CO.

WORCESTER, MASS., U.S.A.

Whitcomb-Blaisdell Planers

STEINLE



One of the reasons why the Steinle 24" Full Swing Side Carriage Turret Lathe is ahead of all others in the economical and accurate production of many classes of work.

The Constant Power Single Pulley Drive

This feature insures the same amount of power being delivered to the machine at all times. It does away with power losses due to variation in the amount of belt contact always in evidence when cone pulleys are used.

One belt furnishes power for all functions of the machine. As long as this one belt is kept in proper condition the operator never has trouble with the power traverse of the carriages or pump, as the power for operating these features is derived from the main drive through geared connections and not through belts.

No countershaft to oil or get out of kelter.

Consider the advantages: ONE BELT direct from line shaft or motor, Thirty Reversible Spindle Speeds, Power Traverse for Both Carriages, Independent Feed for Both Carriages, Cutter Lubricant Pump, ONE BELT.

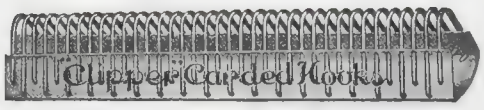
The operator can give all his attention to the cutting tools, feeds and speeds, resulting in more and better work.

There are more good reasons why the Steinle 24" Full Swing Side Carriage Turret Lathe is ahead of all others in the economical and accurate production of many classes of work. We will give these reasons in future advertisements in this Journal. Watch for them. They will be interesting to you.

STEINLE TURRET MACHINE CO.

MADISON - - WISCONSIN, U.S.A.

Clipper
Clipper Belt Lacer Co.



First Aid and Permanent Repair



Clipper Belt Lacing played an important part in the fierce manufacturing energy of the war years. The Clipper is helping in a hundred thousand plants to speed up huge reconstruction programs and magnified trade demands. The breaking of a belt used to be a serious interruption to manufacturing before Clipper Belt Lacing came. It meant a costly delay. It used to take from 15 minutes to half an hour to accomplish even makeshift belt repairs.

The Clipper Belt Lacer
Laces a Belt in Three Minutes

The Clipper not only does the job quickly but does it better. A Clipper laced joint is as strong and lasts as long as the belt itself. It is smooth and flush with the belt on both sides. There is absolutely no friction loss. And the cost of mending a joint with the Clipper is a mere trifle.

In many big plants several Clipper Lacing Tools are kept handy for emergency use. The operation of lacing a belt with the Clipper is so simple that any workman can do it. It is never necessary to call in an expert belt-mender in factories where the Clipper is used.

The Clipper was awarded by the American Museum of Safety the only gold medal ever given for metal lacing. The Clipper is perpetually guaranteed and goes to manufacturers on free trial. Get the Clipper on guard in *your* plant. It will forever end your belt lacing troubles.



There are many mill supply dealers in Canada who handle the Clipper. If you do not know who they are, write us.

London, England: No. 10 Norfolk St.

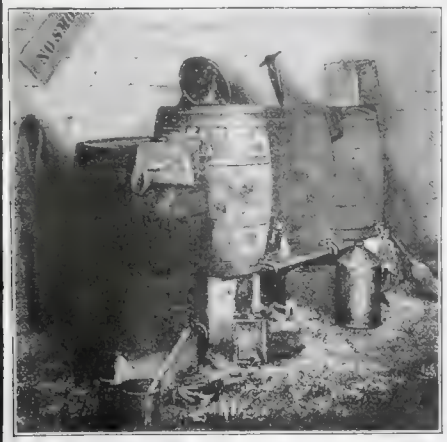
Clipper Belt Lacer Company
GRAND RAPIDS, MICHIGAN, U. S. A.

Distributors in all parts of the World

Does Your Storage System Save Oil?

If you have never studied the question of storing, distributing and using oils, you will be surprised to know the enormous losses that occur daily wherever oils are handled by inefficient methods. Losses that could easily be prevented by use of

BOWSER OIL STORAGE SYSTEMS



Such Conditions Are Wasteful, Dangerous, Unnecessary

Save All the Oil!

Store oils in leakproof, dirt-proof tanks. There is no loss of oils from any source, no loss of quality. Labor in handling is cut to the absolute minimum.

Write for literature describing equipment for your needs.

S. F. BOWSER CO., LTD.

66-68 Frazer Avenue
TORONTO, ONT.

LONDON 32 Victoria St. S. W. 1
PARIS 5 Rue Denis-Poissons
HAVANA Lonja del Comercio 427
SYDNEY 6 Castlereagh St.



The Bowser Way—Safe, Loss-proof, Convenient, Clean, Systematic



Its strength is surprising. The all-steel working parts mean that you can depend on it, too. It has a safety factor of 3½ to 1 in its weakest part—no greater is found in any hand-chain hoist.

And just because those working parts are steel instead of the ordinary cast iron, a Tribloc is not only stronger and safer, but also wears longer.

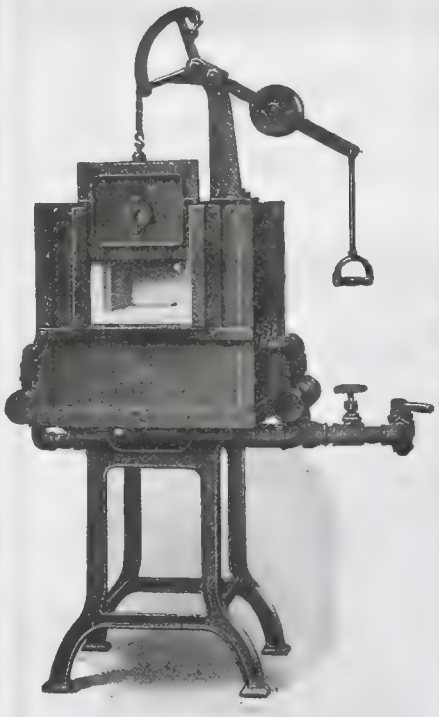
The safety is further increased by our patented loop hand-chain guide—which prevents the "gagging" of the hand-chain at any speed or any angle.

Nothing that could add to the efficiency or safety of a Tribloc has been overlooked. It's so good we guarantee it for five years.

You'll find details and prices in our Catalog No. 3, which comes to you on request.

Ford Chain Block and Mfg. Company

Philadelphia, Pa.



TYPE K HIGH SPEED
STEEL FURNACE

The Right Furnace for High Speed Steel

Too much—too little or an uneven heat treatment of High Speed Steel renders it practically worthless for the purpose intended.

This Gilbert & Barker furnace has been designed especially for the correct heat treatment of High Speed Steel. A temperature of 2400°F. is quickly obtained and **easily maintained.** The heat is uniform on all sides of the work and loss by radiation is reduced to the minimum by special insulation.

More than 50 years' experience in designing and building furnaces, especially for the accurate and economical heat treatment of metals is your guarantee of satisfaction.

PROMPT DELIVERY ON G. & B. FURNACES

Recent additions to our plant, already one of the largest in this field, makes it possible to offer immediate shipment of your order.

Tell us your problem and we will tell you the type of furnace you require, but first send for Bulletin 24. To-day is a better day than to-morrow--write.

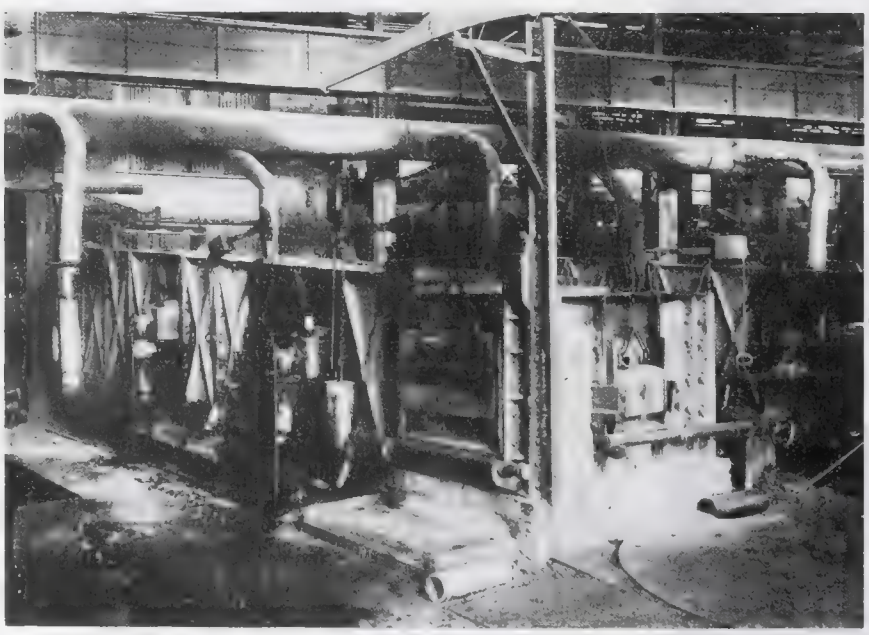
Gilbert & Barker Mfg. Co.

West Springfield, Mass., U.S.A.

Canadian Agents: Williams & Wilson, Montreal, Que. New York Office, 26 Broadway.

Another MECOL Furnace

demonstrated its superior features point by point to a group of men whose years of experience in the heat-treatment of metals made them appreciative judges. We refer to the "Mecol" Furnace shown in this illustration, installed at the Pointe St. Charles Works of the Canadian Steel Foundries, Limited.



Our intimate knowledge of heat-treating methods, and our long experience in the building of efficient furnaces fit us to give helpful advice—and that we will do promptly if you

Write

Mechanical Engineering

Company, Limited

Room 308, Bank of Toronto Building, Montreal
Three Rivers, Quebec, Canada

SAVE TONS

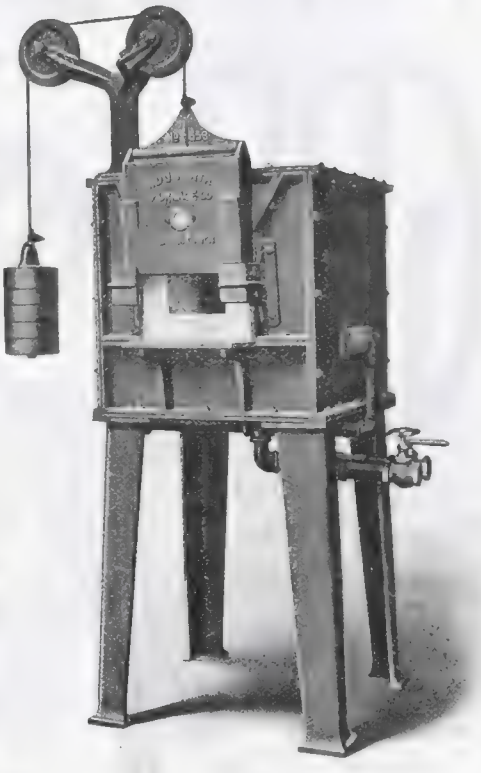
An old, inefficient furnace every working hour is building a monument of clinkers and ash to **profits lost needlessly.**

Bellevue Furnaces

because each designed for a specific purpose, economize fuel and save labor wherever in use.

Bellevue furnaces cover the entire industrial field—79 different styles; 41 extra sizes.

Say that we may send you more particulars.



Bellevue Industrial Furnace Co.
JULIUS HINZ, PRESIDENT
703 Bellevue Ave. - Detroit, Mich.
Representative in Canada:
H. W. Petrie, Limited Toronto, Canada

ECONOMIZER FORGE



It is economical in fuel, air and power; protects workmen from flame and hot gases and the heated material from oxidation or scale; increases the quantity and improves the quality of heated products; prevents smoke, flame and heat escaping into forge shop.

Write to-day for catalog 34-T

W. S. ROCKWELL COMPANY
Furnace Engineers and Contractors
50 Church Street New York
(Hudson Terminal Bldg.)
Canadian Representative: R. J. McLean
128 Bleury St., Montreal, Canada.

STANDARD FURNACES

OIL or GAS

Prompt delivery on all tool room types



FORGING FURNACE

For
Annealing
Carbonizing
Hardening
High Speed Steel
Lead and Salt
Oil Tempering
Forging
Riveting

Toronto Office:
STANDARD FUEL ENGINEERING CO.
W. H. KIRK, Manager
909 Excelsior Life Building.
Phone, Main 385

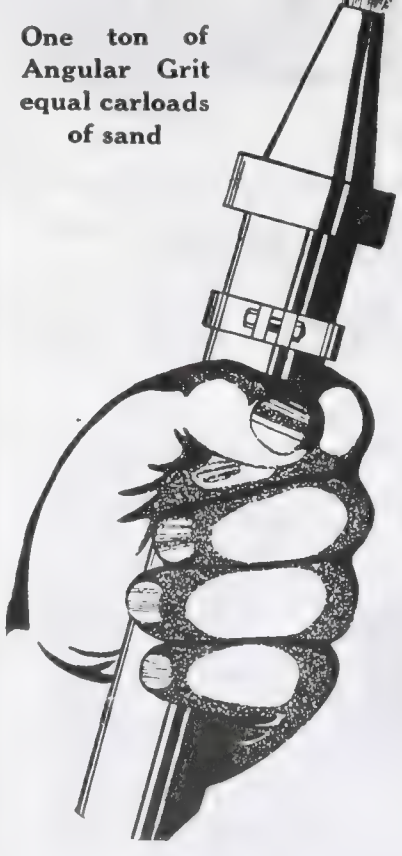
STANDARD FUEL ENGINEERING CO. DETROIT, MICH.

ANGULAR GRIT

Saves Labor
Saves Time
Saves Costs

Quicker and Better

One ton of Angular Grit equal carloads of sand



ANGULAR GRIT offers you the most advanced and economical method of cleaning castings, etc. Its angular and irregular cutting points clean raw castings and forgings more thoroughly and with greater speed than either sand or shot.

ANGULAR GRIT dispenses with sand bins and sand dryers, and there is no dust nuisance where it is used.

If you are using sand, think of the labor you can save by adopting ANGULAR GRIT in its place.

Used for all kinds of cleaning operations—best materials for cleaning shells. Prove its superiority by giving it a trial.

Pittsburgh Crushed Steel Co.
Established 1888
Pittsburgh, Pa., U.S.A.

Canadian Representatives:
Williams and Wilson Ltd., Montreal, P.Q.



Wire Cloth

of every description

We make **Machinery Guards** of all kinds.

Metal Lockers for Clothes.

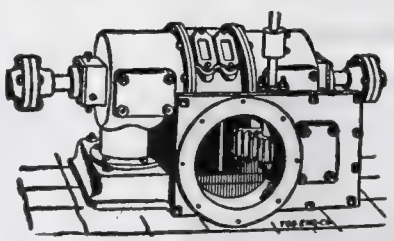
Overhead Wire Guards for Elevators.

Drop a line for full details.

Canada Wire & Iron Goods Company
Hamilton, Ontario

Eastern Representative:
H. E. O. Bull, 184 Mance St., Montreal, Que.

WATER POWER DEVELOPMENT



Over forty years' experience in designing and installing special turbines, both on vertical and horizontal shafts.

Can supply complete equipment, including flume, turbine and power transmission.

Stock of standard vertical shaft Little Giant Turbines on hand for prompt shipment.

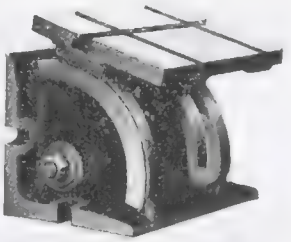
We solicit your inquiries.

J. C. WILSON & CO.
BELLEVILLE, ONTARIO

TAFT-PEIRCE
Tool-Room Specialties



External Limit Gage
Style 31



Tool Makers Adjustable Knee
Style 170

Why use home-made tool room devices which are always expensive, not always satisfactory and often delay work because of the time required to make them?

Why not use Taft-Peirce tool-room specialties—no bother, no delay, and no uncertainty.



Adjustable External Limit Gage
Style 32



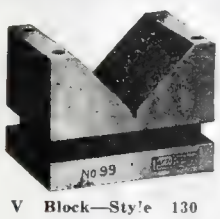
Sine Bar Fixture—Style 120



Style 11 Limit Plug Gage Style 13 Handle Style 12

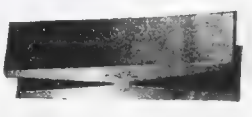


Steel Parallels—Style 150



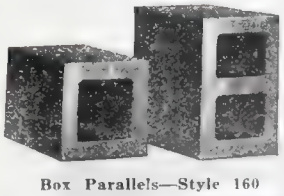
V Block—Style 130

As to character and quality, Taft-Peirce tool-room specialties have been standardized. They are manufactured in quantities, cost less than those made in your own tool-room, and the line is complete enough to meet most requirements.



Equalizing Jaw—Style 140

Ask your dealer or write for catalogue 104 E.



Box Parallels—Style 160



Tool Makers Knee—Style 180

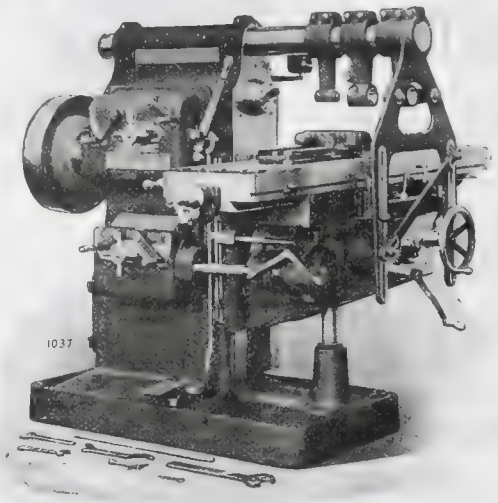
TAFT-PEIRCE
Woonsocket, R.I., U.S.A.

New York, Woolworth Building Detroit, Majestic Building

Williams & Wilson Ltd., Montreal and Quebec.

2059

Cincinnati High Power Millers



One of our 9 High Power Single Pulley Plain Millers. We also make 9 cone driven plain machines, and a full line of Universals.

Unusual Spindle Power

Heat Treated Alloy Steel Gearing for the Spindle Drive

Flanged Spindle End

which makes Face Milling Cutters Interchangeable in all sizes of Machines

Handy and Easy to Operate

These are some of the reasons why you should use

Cincinnati High Power Millers

ASK FOR CATALOGUE

The Cincinnati Milling Machine Company

CINCINNATI, OHIO

Canadian Agents:

Taylor Engineering Co., Ltd. - Vancouver, B.C.
H. W. Petrie, Ltd. - - - Toronto, Ont.
H. W. Petrie, of Montreal, Ltd., Montreal, Que.
General Supply Co., of Canada - Winnipeg, Man.

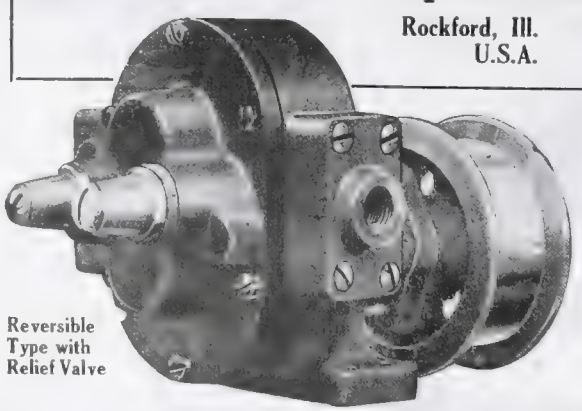
NO PULSATION

TRAHERN lubricating pumps are Rotary Geared. This type of construction insures a steady even pumping movement, in either direction, which forces a copious stream of lubricating coolant into the deepest cuts. The stream is forced from the pump in an even flow, absolutely free from pulsation.

This steady flood of coolant increases the efficiency and prolongs the life of your equipment and insures a higher grade of work turned out at lower cost.

Trahern Pump Co.

Rockford, Ill.
U.S.A.

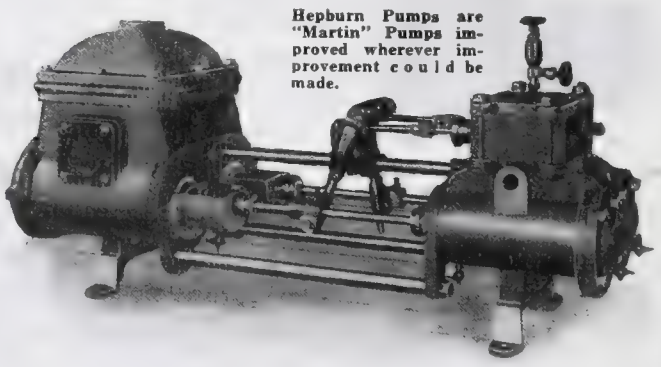


Reversible Type with Relief Valve

Hepburn Pumping Machinery

Our line embraces standard duplex pumps for boiler feeding and for fire and general service; tank or low service duplex pumps; duplex hydraulic pumps for service in connection with hydraulic lifts and presses, accumulators and oil presses; pressure or mine pumps; horizontal power pumps and air and circulating pumps, etc.

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This waste cost
13 cents a pound

This waste cost
¾ of a cent a pound

Wash your waste and save the difference.

The difference between 3/4 of a cent and what you are paying for waste and wiping cloths represents the saving on each pound you wash in OAKITE.

The oil can be reclaimed, which further reduces the expense. Waste and wiping cloths can be washed in Oakite from 50 to 150 times.

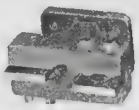
Instead of destroying the fibres of the waste, Oakite makes them softer and more absorbent than when new. Expensive apparatus not necessary.

A handy booklet telling you how to rig up a waste washing outfit in your plant will be sent on request.

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OAKLEY CHEMICAL CO.
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No. 121
Die Adapter



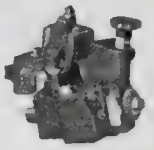
No. 148
Facing Head



Increased Capacity Draw Back Collet with Bushings



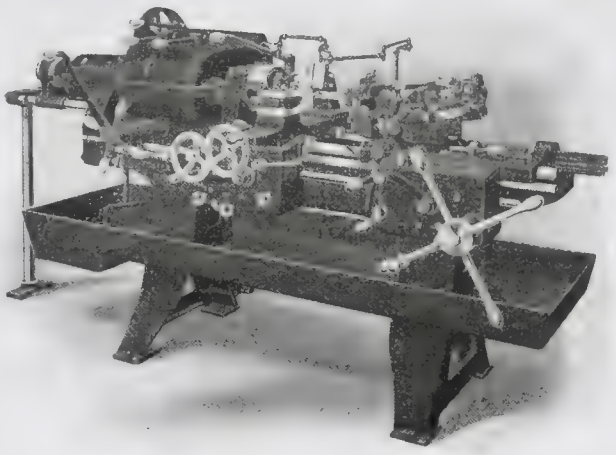
No. 147
Multiple Turning Head



No. 138
Single Cutter Turner



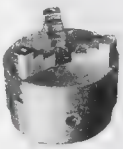
No. 144—
Slide Tool



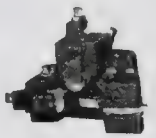
1-B Universal Turret Lathe



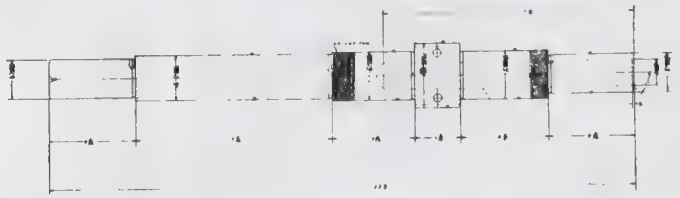
No. 155
Recessing and Boring Tool



Scroll Chuck

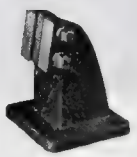


No. 140
Pointing Tool





No. 142
Center Drilling Tool



No. 149
Rear Forming Tool Holder



No. 141
Flanged Tool Holder



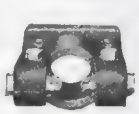
No. 103 B
Split Bushing



No. 145
Rear Tool Holder



No. 139
Multiple Cutter Turner



No. 143
Knurling Tool



Draw-Back Collet with Bushings



No. 103A
Flat Cutter Bushing



Taper Attachment



No. 102 A
Adapter for Forged Cutters

No. 107C



Pilot Bar

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Bar Cap. 2" Swing over Carriage, 14" over Cross Slide, 8"

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Bar Cap. 1⅜" 14" Swing

No. 3 FRICTION HEAD UNIVERSAL TURRET LATHE
Bar Cap. 1⅝" 16" Swing

No. 3 FRICTION HEAD SET-OVER TURRET LATHE
Bar Cap. 1⅝" 16" Swing

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Manufactured under the Holden & Morgan Patents

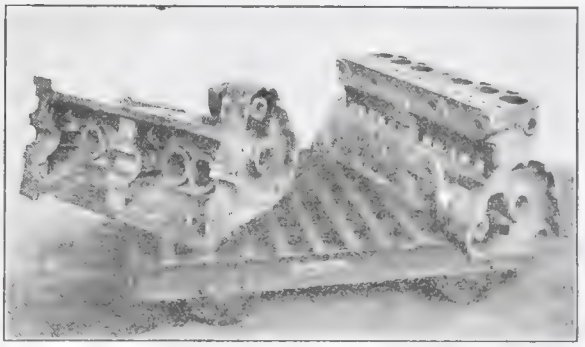
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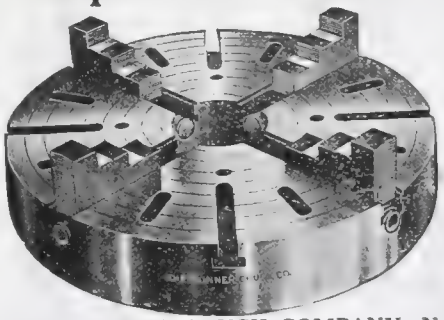
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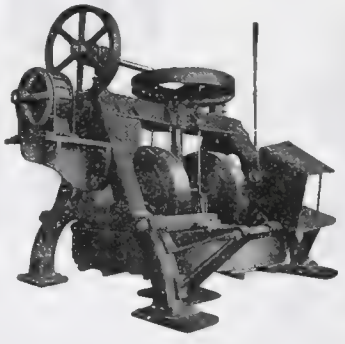
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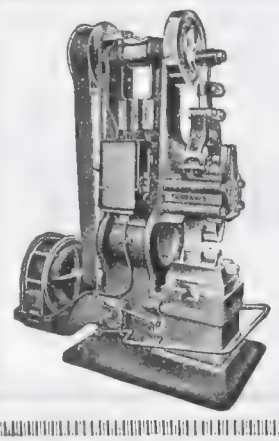
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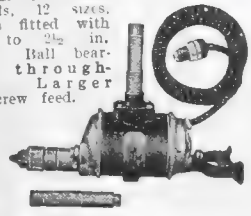
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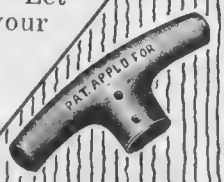
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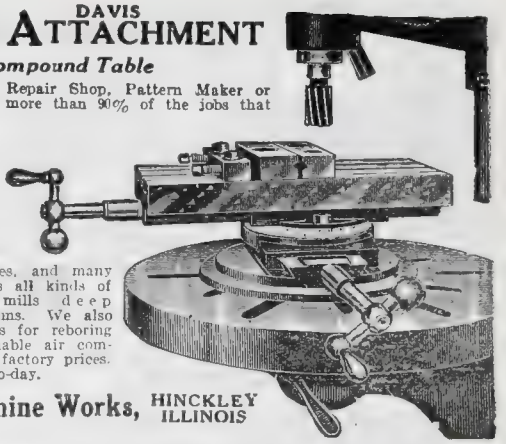
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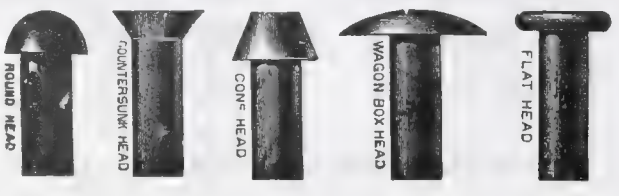


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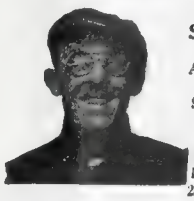
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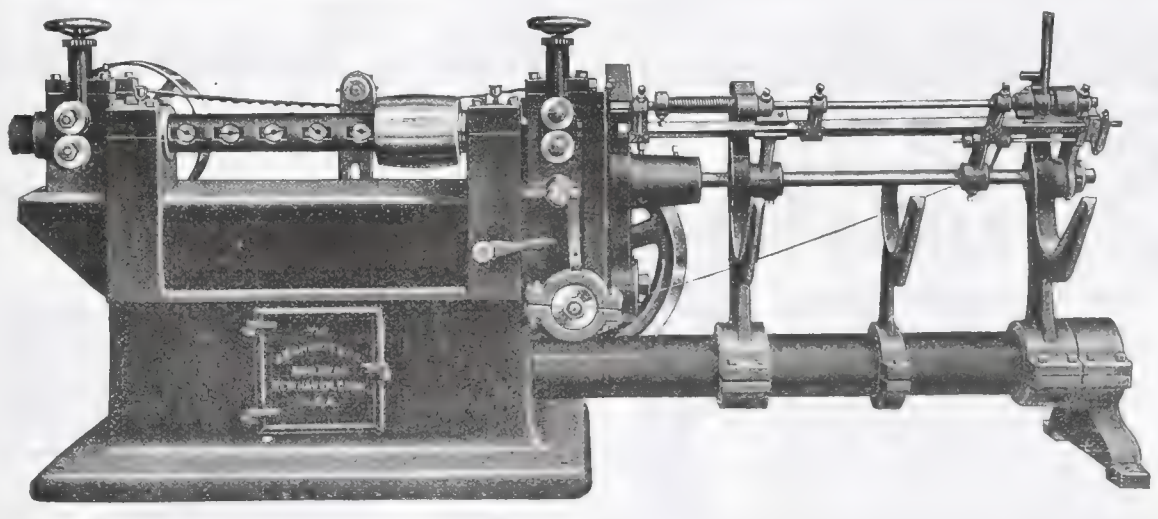
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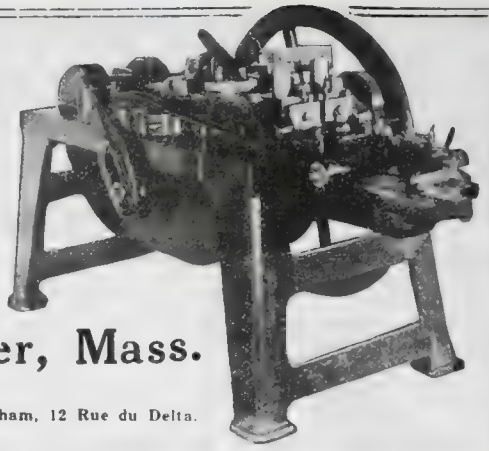
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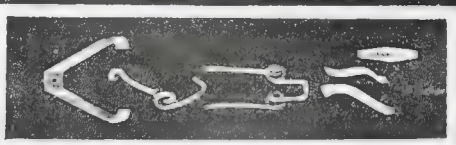
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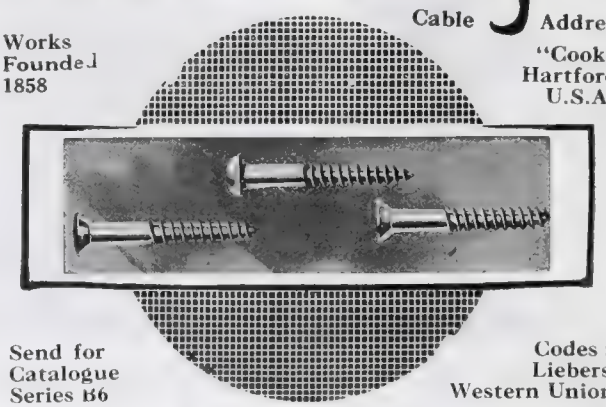


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Can. Ingersoll-Rand Co., Sherbrooke, Que.
Canadian Welding Works, Montreal, Que.
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que
Williams & Wilson, Limited, Montreal, Que.
Welding & Supplies Co., Montreal, Que.

AIR WASHERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.

ALUMINUM
Canada Metal Co., Toronto.
United Brass & Lead, Ltd., Toronto.
Tallman Brass & Metal Co., Hamilton
Williams & Wilson, Limited, Montreal, Que

ALLOY, STEEL
Armstrong, Whitworth, of Canada, Montreal, Que
Boker & Co., Inc., H., Montreal Que.
Firth & Sons, Thos., Montreal, Que.
General Steel Co., Milwaukee, Wis.
Hawkridge Bros. Co., Boston, Mass.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Standard Alloys Company Pittsburgh, Pa.
Swedish Steel & Importing Co., Ltd., Montreal
Vanadium Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

ALTERNATING CURRENT, ELECTRIC WELDING EQUIPMENT
Arcwell Corporation of Can., Toronto, Ont.

ARBORS
Canadian Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
J. C. Wilson & Co., Belleville, Ont.
Garlock-Walker Machinery Co., Toronto, Ont
Morse Twist Drill & Mach. Co., New Bedford, Mass
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Limited, Montreal, Que.

ARCHITECTURAL IRON
Page Steel & Wire Co., Adrian, Mich.

ARRESTERS, DUST
Northern Crane Co., Walkerville, Ont.
Sheldons Ltd., Galt, Ont.
Pangborn Corporation, Hagerstown, Md.

AUTOGENOUS WELDING AND CUTTING PLANTS
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que
Welding & Supplies Co., Montreal, Que.

AUTOMATIC MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto, Ont.
Gardner, Robt., & Son, Montreal.
National Acme Co., Cleveland, O., and Windsor.
Pratt & Whitney Co., Dundas, Ont.
Roelofson Machine & Tool Co., Toronto, Can.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

AUTOMATIC METAL CUTTING-OFF MACHINES
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.
Aikenhead Hardware Co., Toronto, Ont.
Canadian Fairbanks-Morse Co., Montreal
Canada Metal Co., Toronto.
The Geo F. Foss Mchy & Supply Co., Montreal

AUTO SHEET METAL MACHINERY
Quickwork Co., St. Marys, Ohio.

BABBITT METAL
Hoyt Metal Co., Toronto.
Magnolia Metal Co., Montreal
Rice, Lewis & Son, Toronto, Ont.
Tallman Brass & Metal Co., Hamilton
Wilkinson & Kompass Hamilton Ont
Williams & Wilson, Limited, Montreal, Que.

BAND SAWS
Oliver Machinery Co., Grand Rapids, Mich.

BALL BEARINGS
Canadian Fairbanks-Morse Co., Montreal.
Can. S K F Co., Toronto, Ont.
Chapman Double Ball Bearing Company, Toronto
The Gray Ball Bearing Co., Ltd., Toronto.
Rochester Ball Bearing Co., Rochester, N.Y.
Williams & Wilson, Limited, Montreal, Que

BALLS, STEEL
The Gray Ball Bearing Co., Ltd., Toronto
Kacer & Co., Inc., Montreal, Que
Williams & Wilson, Limited, Montreal, Que

BALLS BURNISHING
The Gray Ball Bearing Co., Ltd., Toronto.

BAROMETERS
Taylor Instrument Co., Rochester, N.Y.

BARRELS, SAND-BLAST
Pangborn Corporation, Hagerstown, Md

BARRELS, STEEL SHOP
Baird Machine Co., Bridgeport, Conn.
Cleveland Wire Spring Co., Cleveland.

BARRELS, TUMBLING
Baird Machine Co., Bridgeport, Conn.
Katie Foundry, Galt, Ont
Northern Crane Works, Walkerville, Ont
Wilson & Co., J. C., Belleville, Ont
Whiting Foundry Equipment Co., Harvey, Ill
Williams & Wilson, Limited, Montreal, Que

BASE FACING MACHINES
Victoria Foundry Co., Ottawa, Ont.

BARS, BORING
Gisholt Machine Co., Madison, Wis.
Niles-Bement-Pond Co., New York
Wilson & Co., J. C., Belleville, Ont
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson, Limited, Montreal, Que

BARS, MERCHANT
Algoma Steel Corp., Sault Ste. Marie, Ont.

BARS, CONCRETE REINFORCING
Algoma Steel Corp., Sault Ste. Marie, Ont.

BEADING MACHINES
Quickwork Co., St. Marys, Ohio

BELT CONVEYORS
Can. Link-Belt Co., Toronto, Ont
Williams & Wilson, Limited, Montreal, Que

BEARINGS, BRONZE
Wilson & Co., J. C., Belleville, Ont.
Wentworth Mfg. Co., Hamilton, Ont.

BEARINGS, DIE CAST
Franklin Mfg. Co., Syracuse, N.Y.

BEARINGS, HIGH SPEED, OR HEAVY DUTY BRONZE
Wentworth Mfg. Co., Hamilton, Ont.

BELT LACERS
Clipper Belt Lacer Co., Grand Rapids, Mich.

BELT-LACING MACHINES, HOOKS AND PINS
Clipper Belt Lacer Co., Grand Rapids, Mich

BELT LACING LEATHER
Aikenhead Hardware Co., Toronto, Ont.
Foss Mchy & Supply Co., The Geo. F., Montreal
Graton & Knight Mfg. Co., Worcester, Mass
Rice, Lewis & Son, Toronto, Ont

BELT HOOKS, WIRE
Clipper Belt Lacer Co., Grand Rapids, Mich.

BELTING, BALATA
Baxter & Co., Ltd., J. R., Montreal, Que.
Federal Engineering Co., Toronto, Ont.

BELTING, RUBBER
Can. Consolidated Rubber Co., Ltd., Montreal.
Gutta Percha & Rubber, Ltd., Toronto, Can.

BELTING, CHAIN
Canadian Fairbanks-Morse Co., Montreal.
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Whitney Mfg. Co., Hartford, Conn.
Williams & Wilson, Limited, Montreal, Que.

BELTING, CONVEYOR
Can. Consolidated Rubber Co., Ltd., Montreal
Baxter & Co., Ltd., J. R., Montreal, Que
Canadian Fairbanks-Morse Co., Montreal.
Federal Engineering Co., Ltd., Toronto, Ont
Graton & Knight Mfg. Co., Worcester, Mass
Jones & Glassco, Montreal, Que.
McLaren, J. C., Belting Co., Montreal, Que
Morse Chain Co., Ithaca, N.Y.
Plewes, Ltd., Winnipeg, Man.
Rice, Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que
Williams & Wilson, Limited, Montreal, Que.

BELTING, FRICTION AND SURFACE
Can. Consolidated Rubber Co., Ltd., Montreal

BELTING, LEATHER
Can. Graton & Knight Mfg. Co., Montreal, Que
Gutta Percha & Rubber, Ltd., Toronto, Can.

BELTING, STITCHED COTTON DUCK
Dominion Belting Co., Hamilton, Ont.
Gutta Percha & Rubber, Ltd., Toronto, Can.

BELTING, WOVEN
Baxter & Co., Ltd., J. R., Montreal, Que.
Federal Engineering Co., Ltd., Toronto, Ont.

BENCH LEGS, STEEL
New Britain Mach. Co., New Britain, Conn

BENCH DRAWERS, FRICTIONLESS
New Britain Mach. Co., New Britain, Conn

BENDING ROLLS (PLUTE & AUGH)
Wickes Bros., Saginaw, Mich.

BENDING MACHINERY
Bertram & Sons Co., John, Dundas
Bertrams, Limited, Edinburgh, Scotland.
Brown-Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Kitchener, Canada
Garlock-Walker Machinery Co., Toronto, Ont
Williams & Wilson, Limited, Montreal, Que.

BLASTING MACHINES, SAND
Ferracute Mach. Co., Bridgeton, N.J.
Garlock-Walker Machinery Co., Toronto, Ont
Jardine, A. B., & Co., Hespeler, Ont.
National Machinery Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, Ohio
Williams & Wilson, Limited, Montreal, Que.

BILLET MARKERS
Matthews & Co., Jas. H., Pittsburgh, Pa

BILLETS
Swedish Steel & Importing Co., Ltd., Montreal.
Algoma Steel Corp., Sault Ste. Marie, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal

BILLETS, FORGING
General Steel Co., Milwaukee, Wis
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal

BINS, STEEL
Dennis Wire & Iron Works, London, Ont
Dominion Bridge Co., Montreal, Que
MacKinnon Steel Co., Sherbrooke, Que
Toronto Iron Works, Ltd., Toronto, Ont

BLACKSMITH WORK
James Ballantyne, Montreal.
The Thos. Pink Co., Ltd., Pembroke, Ont.

BLANKING
Henry Hope & Sons of Canada, Ltd., Peterboro

BLASTING MACHINES, SHOT AND STEEL GRIT
Pittsburgh Crushed Steel Co., Pittsburgh, Pa

BLOOMS AND SLABS
Algoma Steel Corp., Sault Ste. Marie, Ont.

BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons Ltd., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont
MacGovern & Co., Montreal, Que
Williams & Wilson, Limited, Montreal, Que.

BLOW PIPES AND REGULATORS
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont
Welding & Supplies Co., Montreal, Que.

BLUE PRINTING MACHINERY
Commercial Camera Co., Province, R.I.
Mulliner-Edlund Tool Co., Syracuse, N.Y.
Wickes Bros., Saginaw, Mich

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Lufkin Rule Co. of Can., Windsor, Ont.

BOARTZ
Anderson & Co. of Canada, Geo., Montreal, Que.
Joyce, Koebel & Co., Inc., New York.

BOLT CUTTERS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

BOOKS, TECHNICAL
MacLean Publishing Co., Toronto.

BOILERS
Dominion Bridge Co., Montreal, Quebec.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Riverside Machinery Depot, Detroit, Mich.

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Aikenhead Hardware Co., Toronto, Ont.
Canadian Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Rice, Lewis & Son, Toronto, Ont
Wells Brothers Co. of Canada, Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

BOLTS
Aikenhead Hardware Co., Toronto, Ont.
London Bolt & Hinge Works, London, Ont.
Rice, Lewis & Son, Toronto, Ont.
Manitoba Bridge & Iron Wks., Ltd., Wpg., Can.
Steel Co. of Canada, Ltd., Hamilton, Ont.
United Brass & Lead, Ltd., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

BOLTS, SPRING SHAKLE
Can. Winkley Co., Ltd., Windsor, Ont.

BOLT AND NUT MACHINERY
Bertram & Sons Co., John, Dundas.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Gardner & Son, Robt., Montreal.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Riverside Machinery Depot, Detroit, Mich.
Williams & Wilson, Ltd., Montreal, Que.
Williams Machinery Co., A. R., Toronto.

BOLT THREADING MACHINERY
Jardine & Co., Ltd., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.
Williams & Wilson, Limited, Montreal, Que.

BORING MACHINES, PNEUMATIC CYLINDER
Cleveland Pneumatic Tool Co. of Canada, Toronto
Canadian Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto, Ont.

BORING MACHINES, UPRIGHT AND HORIZONTAL
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Giddings & Lewis Mfg. Co., Fond du Lac, Wis
Gisholt Machine Co., Madison, Wis.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto, Ont.
Williams & Wilson, Limited, Montreal, Que.

BORING AND TURNING MILLS
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis
Foss Mchy. & Supply Co., The Geo. F., Montreal.
Oliver Machinery Co., Grand Rapids, Mich.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal, Que.

BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland, Ohio.
New Britain Mach. Co., New Britain, Conn.

BRAKEBAND LINING CUTTERS
Peck, Stow & Wilcox Co., Southington, Conn.

BRAKES
Brown, Boggs & Co., Hamilton, Can.
Electric Steel & Metals, Ltd., Welland, Ont.

BRASS AND COPPER BARS, RODS

BRAKES, CORNICE
Peck, Stow & Wilcox Co., Southington, Conn.

AND SHEETS
Brown's Copper & Brass Rolling Mills, New Toronto.
Tallman Brass & Metal Co., Hamilton, Ont.

BRASS FOUNDERS
Canada Metal Co., Toronto.
Greenleafs, Ltd., Belleville, Ont.
St. Lawrence Welding Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.
United Brass & Lead Ltd., Toronto.
Wilson & Co., J. C., Belleville, Ont.

BRASS WORKING MACHINERY
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto, Ont.
Warner & Swasey Co., Cleveland.
Niles-Bement-Pond Co., New York.
Prest-O-Lite Co. Inc., Toronto, Ont.
Wood Turret Machine Co., Brazil, Ind.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

BRICKS, FIRE
Harbison-Walker Refactories Co. of Canada, Montreal, Que.

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Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Manitoba Bridge & Iron Wks., Ltd., Wpg., Can

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BRONZE, NAVAL
Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto
Tallman Brass and Metal Co., Hamilton, Ont.
United Brass & Lead Ltd., Toronto.

BRONZE, COPPER
Canada Metal Co., Toronto.

BUFFING AND POLISHING MACHINERY
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & Supply Co., The Geo. F., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Machine Co., New Britain, Conn.
Williams & Wilson, Limited, Montreal, Que.

BUCKETS, DUMP
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

BUCKETS, ELEVATOR
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

BUCKETS, CLAM SHELL, CRAB, DUMP
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Ltd. ,Walkerville, Ont.

BULLDOZERS
Bertram & Sons Co., John, Dundas.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Williams & Wilson, Limited, Montreal, Que.

BURNERS, OIL AND NATURAL GAS
Northern Crane Works, Ltd., Walkerville, Ont.

BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananogue, Ont.

BUSHINGS, BRONZE
Oberdorfer Brass Co., M. L., Syracuse, N.Y.

CALIPERS
Peck, Stow & Wilcox Co,, Southington, Conn.

CABINETS, SAND BLAST
Pangborn Corporation, Hagerstown, Md.

CALKS, BOOT
Lufkin Rule Co. of Can., Windsor, Ont.

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Brown's Copper & Brass Rolling Mills, New Toronto.

CANNERS' MACHINERY
Bliss, E. W. Co., Brooklyn, N.Y.
Ferracute Mach. Co., Bridgeton, N.J
Brown, Boggs & Co, Hamilton, Can

CANNERS' CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Wilson & Co., J. C., Belleville, Ont.

CARBONIZING BOXES
Katie Foundry, Galt, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Swedish Crucible Steel Co., Windsor, Ont.

CARRIERS, PNEUMATIC TUBE
Jones & Glassco, Montreal.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Can.
Canadian Fairbanks-Morse Co., Ltd., Montreal
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Sheldons, Limited, Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CASTINGS, MACHINERY
Winnipeg Iron Foundry Co., Winnipeg.
Wilson & Co., J. C., Belleville, Ont.

CASTINGS, ALUMINUM, BRASS, BRONZE, COPPER AND GUN METAL
Algoma Steel Corp., Sault Ste. Marie, Ont.
Brockville Foundry Co., Brockville, Ont.
Franklin Mfg. Co., Syracuse, N.Y.

CASTINGS, DIE CAST
Franklin Mfg. Co., Syracuse, N.Y.
Wentworth Mfg. Co., Hamilton, Ont.

CASTINGS, STEEL—ALL KINDS
Electric Steel & Metals Co., Welland, Ont.

CARRIERS
Alexander Fleck, Ltd., Ottawa.
Greenleafs, Ltd., Belleville, Ont.
Oberdorfer Brass Co., M. L., Syracuse, N.Y.
St. Lawrence Welding Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton.
United Brass & Lead Ltd., Toronto.

CASTINGS, BRASS AND IRON
Algoma Steel Corp., Sault Ste. Marie, Ont.

CASTINGS, BUILDING
Katie Foundry, Galt, Ont.

CASTINGS, GRAY IRON
Bernard Industrial Co., The A., Fortierville, Que.
Brown, Boggs Co., Ltd., Hamilton, Can.
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Greenleafs, Ltd., Belleville, Ont.
Hull Iron & Steel Foundries, Ltd., Hull, Que.
International Malleable Iron Co., Guelph, Ont.
Kennedy & Sons, Ltd., Wm., Owen Sound.
Katie Foundry, Ltd., Galt, Ont.
Sheldons, Limited, Galt, Ont.
Hamilton Co., Wm., Peterboro.
Wilson & Co., J. C., Belleville, Ont

CASTINGS, PLUMBERS'
Katie Foundry, Galt, Ont.

CASTINGS, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

CASTINGS, HARDWARE
Katie Foundry, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Thos. Davidson Mfg. Co., Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont
Hull Iron & Steel Foundries, Ltd., Hull, Que
Kennedy & Sons, Ltd., Owen Sound.

CASTINGS, MALLEABLE
International Malleable Iron Co, Guelph, Ont

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull, Que

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Canadian Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son Montreal.

CEMENT HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
Bertram & Sons Co., John, Dundas.
Gardner, Robt., & Son, Montreal.
Hurlburt, Rogers Mach. Co., South Sudbury, Mass.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

CHAIN, WELDED COIL
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Ford Chain Block & Mfg. Co., Philadelphia, Pa.
Garlock-Walker Machy. Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Rice Lewis & Son Toronto, Ont.
Williams & Wilson, Limited, Montreal Que.
Wright Mfg. Co., Lisbon, Ohio.

CHAIN LINKS, DETACHABLE
Fittings, Ltd., Oshawa, Ont.

CHAINS, FOR ELEVATORS AND CONVEYORS
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Morse Chain Co., Ithaca, N.Y.
Williams & Wilson, Limited, Montreal, Que.

CHAIN, MALLEABLE, DETACHABLE AND RIVETED
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson, Limited, Montreal, Que.

CHAIN DRIVES
Can. Link-Belt Co., Toronto, Ont.
Coventry Chain Co., Coventry, England.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Itnaca, N.Y.

CHASERS
National Acme Co., Cleveland, Ohio.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.

CHEMISTS
Toronto Testing Laboratory, Ltd., Toronto.

CHROME VANADIUM STEEL
J. F. A. Comstedt, New York City, N.Y
General Steel Co., Milwaukee, Wis.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

CHROME NICKEL STEEL
J. F. A. Comstedt, New York City, N.Y.
General Steel Co., Milwaukee, Wis.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.

CHUCKS, COLLET, AIR
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Smalley-General Co., Inc., Bay City, Mich.
Williams & Wilson, Limited, Montreal, Que.

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Bertram & Sons Co., John, Dundas.
Can. Blower & Forge Co., Kitchener, Canada.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Foss Mchy. & Supply Co., The Geo. F., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford
Knight Metal Products, Ltd., Toronto, Ont.
Modern Tool Co., Erie, Pa.
Rice, Lewis & Son, Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Whiton Machine Co., D. E., New London, Conn.
Williams & Wilson, Limited, Montreal, Que.

CHUCKS, DRILL AND TAP
Swedish Gage Co., New York, N.Y.

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Canada.
Whitney Mfg. Co., Hartford, Conn.

CHUCKS, FRICTION AND TAP
Victor Tool Co., Waynesboro, Pa.
Wells Bros. Co. of Canada, Galt, Ont

CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Williams & Wilson, Limited, Montreal, Que.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

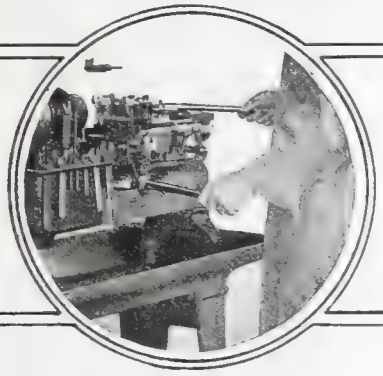
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Thomas Elevator Co., Chicago, Ill.

CHUCKING MACHINES
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
New Britain Machine Co., New Britain, Conn.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto, Ont
Warner & Swasey Co., Cleveland, O.
Wood Turret Mach Co., Brazil, Ind., U.S.A.
Williams & Wilson, Limited, Montreal, Que

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Bowser & Co., S. F., Inc., Fort Wayne, Ind
Williams & Co., J. H., Brooklyn, N.Y.

CLEANING COMPOUND
Oakley Chemical Co., New York.

CLOCK SPRINGS
The Dunbar Brothers Co., Bristol, Conn.



Centralized Control

Means

Greater Quantity

Better Quality



Two Lever Control

On bar stock and work of a similar nature the operator manipulates the turret by means of a lever or pilot wheel with his right hand while with his left he feeds the cross slide tools to the work, and at the end of the operation, when the piece is cut off, pushes the cross slide forward slightly, automatically bringing the next length of stock instantly into position ready for the tools. This largely eliminates making lost motions as the operator remains in the same position at all times.

Brown & Sharpe Plain and Wire Feed Screw Machines

All Levers, Clamps and Pilot Wheels right under the Operator's hands

Three Lever Control

The three lever control is on the larger type machines. The operator manipulates the turret tools by means of a pilot wheel with his right hand while with his left he feeds the cross slide tools to the work and at the end of the operation when the piece is cut off, throws the feed lever which is located on the front of the headstock, in, the stock advances till it reaches the stop and when the lever is released the chuck closes firmly holding the stock. Every crank and lever is so located that the labor involved in operating the machine is a minimum amount.

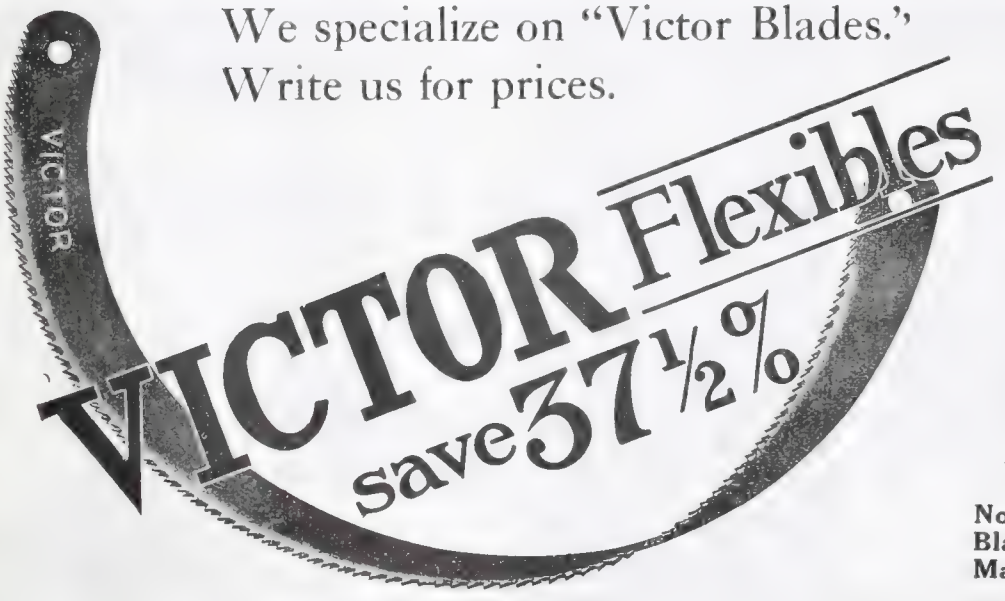
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DUST HANDLING EQUIPMENT
Pangborn Corporation, Hagerstown, Md.

DUST SEPARATORS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.

DYNAMOS AND ELECTRICAL SUPPLIES
Canadian Fairbanks-Morse Co., Montreal.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
Pratt & Whitney Co., Dundas, Ont.
MacGovern & Co., Montreal, Que.
Standard Machy. & Supplies, Ltd., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

ELEVATOR MACHINERY
Manitoba Bridge & Iron Wks., Ltd., Wpg., Can.

ELEVATOR WEIGHTS
Katie Foundry, Galt, Ont.

ELEVATORS AND BUCKETS
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Williams & Wilson, Limited, Montreal, Que.

ELEVATING AND CONVEYING MACHINERY
Can. Link-Belt Co., Toronto, Ont.
Can. Matthews Gravity Carrier Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Williams & Wilson, Limited, Montreal, Que.

EMBOSSING PRESSES
Oliver Machinery Co., Grand Rapids, Mich.

EMERY GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto
Ford-Smith Machine Co., Hamilton, Ont.

EMERY AND EMERY WHEELS
Baxter & Co., Ltd., J. R., Montreal, Que.
Brantford Emery Wheel Co., Brantford, Canada.
Foss Mchy. & Supply Co., The Geo. F., Montreal.
Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Canada Emery Wheels Co., Hamilton, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Limited, Montreal, Que.

EMERY WHEEL DRESSINGS
Wheel Trueing Tool Co., Windsor, Ont.

ENGINES, STEAM, GAS, GASOLINE
Canadian Fairbanks-Morse Co., Montreal.
Gutta Percha & Rubber, Ltd., Toronto, Can.
Johnson Mach. Co., Carlyle, Manchester, Conn.
MacGovern & Co., Montreal, Que.

ENGINES, HORIZONTAL AND VERTICAL
Johnson Mach. Co., Carlyle, Manchester, Conn.
Sheldons, Ltd., Galt, Ont.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

ENGINE LATHES
Oliver Machinery Co., Grand Rapids, Mich.

ENGINES, MARINE
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

ENGINE SHAFTS
Hammond Steel Co., Inc., Syracuse, N.Y.

ENGRAVERS
Pritchard-Andrews Co., Ottawa.

ESCUTCHEON PINS
Parmenter & Bulloch Co., Gananoque, Ont.

ETCHING MACHINES
Brewster Co. ,Wm., New York, N.Y.

EXHAUST HEADS AND HOODS
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.

EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
Pangborn Corporation, Hagerstown, Md.
Sheldons, Ltd., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

EXTRUSION DIE STEEL
J. F. A. Comstedt, New York City, N.Y.

EXTRACTORS, TAP
Walton Co., The, Hartford, Conn.

EXTRA TOOL STEEL
J. F. A. Comstedt, New York City, N.Y.

EYE BOLTS AND NUTS
Can. Foundries & Forgings, Ltd., Welland, Ont.
United Brass & Lead, Ltd., Toronto.

FACTORY GATES
Page Steel & Wire Co., Adrian, Mich.

FANS
Baird Machine Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.

FENCING, WIRE
Page Steel & Wire Co., New York, N.Y.
Williams & Wilson, Limited, Montreal, Que.

FENCE, IRON AND FACTORY
Canada Wire & Iron Goods Co., Hamilton, Ont.
Page Steel & Wire Co., Adrian, Mich.

FERRO-TUNGSTEN
Vanadium-Alloys Steel Co., Pittsburgh, Pa.

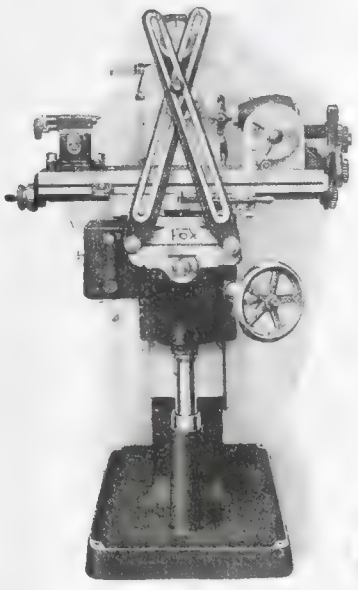
FILES
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Delta File Works, Philadelphia, Pa.

TRADE FOX MARK
REGISTERED

MILLING MACHINES

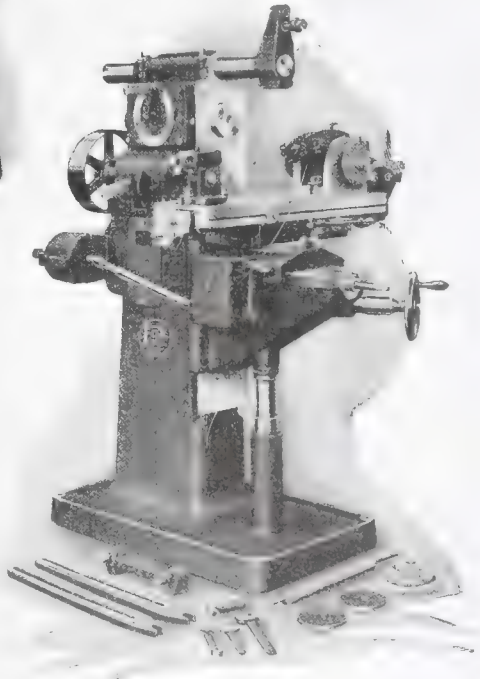
FOR

Rapid Production of Motor Parts



The **demand** for increased production **requires tools** of **great strength** and **durability**; the Fox 2-A Universal Milling Machine illustrated has met this demand, and is being used wherever extreme accuracy and quantity production are required.

The machine has a universal table, spiral cutting attachment, 10″ Dividing Head with 6″ Universal Chuck, making it a machine **especially adapted for Tool Room Work.**



The **United States Government** used this machine in its various **repair shops** for **Aeroplane Motors.**

You should be using this tool to help the production of parts necessary for reconstruction.

Specifications—No. 2-A Miller.

Spindle speeds . . . 12
From 21 to 423 r.p.m.

Table feeds . . . 6
From .317″ to 2.79″ per min.

Table 8½ x 27″
Long. feed (power) 26″.
Vertical feed (hand) 13″.
Trans. feed (hand) 8½″.

Drive . . . Single pulley 10 x 3″ running 250 r.p.m.

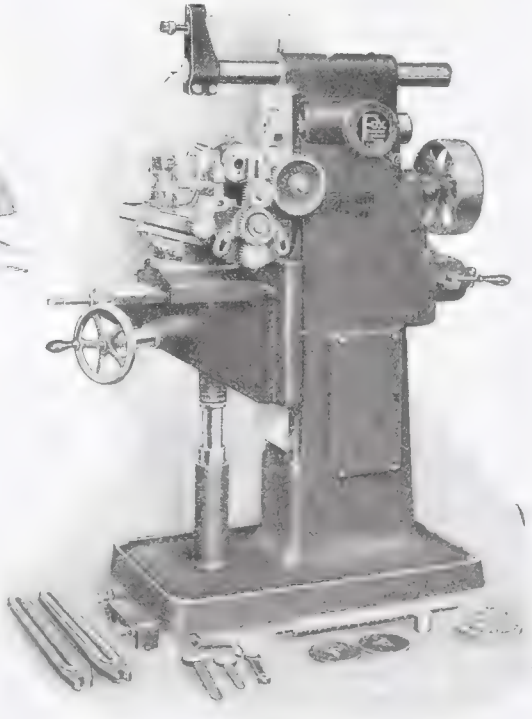
Gears . . . Hardened steel.

Weight . . . 1,500 lbs.

We build this same machine with a plain table, omitting the spiral cutting attachment and Dividing Head.

Our No. 1 type machine has a four-step cone drive, and while being a lighter machine is a "bear" for work. This was proven by **the hundreds** of **them in the largest munitions plants.**

We also build the Fox Multiple Spindle Drilling Machines.



FOX MACHINE COMPANY

1047 W. Ganson St., Jackson, Michigan, U.S.A.

Ingersoll File Co., Ltd., Ingersoll, Ont.
Marshall & Co., Geo., Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Wilkinson & Kompass, Hamilton, Ont.

FILLING STATION EQUIPMENT
Bowser & Co., S. F., Inc., Fort Wayne, Ind.

FILTERING AND CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser & Co., S. F., Inc., Fort Wayne, Ind
Canada Wire & Iron Goods Co., Hamilton, Ont.

FIRST AID CABINETS
Strong, Kennard & Nutt Co., Cleveland, Ohio.

FIRE BRICKS
Harbison Walker Refactories Co. of Canada, Montreal, Que.

FITTINGS, MALLEABLE AND CAST IRON
Fittings, Ltd., Oshawa, Ont.

FIXTURES
Brown Engineering Corp., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ontario.
Toronto Tool Co., Toronto, Ont.

FLEXIBLE SHAFT COILING MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

FLAT SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

FLANGING CLAMPS
Wickes Bros., Saginaw, Mich.

FORGES, HAND PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.
Sheldons, Ltd., Galt, Ont.

FORGINGS, STEEL AND IRON
Can. Foundries & Forgings, Ltd., Welland, Ont.
Nova Scotia Steel & Coal Co., New Glasgow, N.S

FORGINGS, DROP, AUTOMOBILE AND LOCOMOTIVE

FORGING AND WELDING
Victoria Foundry Co., Ottawa.
Can. Billings & Spencer, Ltd., Welland, Ont.
Dominion Bridge Co., Montreal, Que.
Dom. Forge & Stamping Co., Walkerville, Ont.
Manitoba Bridge & Iron Wks., Ltd., Wpg., Can.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

FORGING MACHINERY
John Bertram & Sons Co., Dundas.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Williams & Wilson, Limited, Montreal, Que.

FORGINGS, SPECIAL
Armstrong, Whitworth of Canada, Montreal, Que
Canada Foundries & Forgings, Ltd., Welland, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

FORMING
Henry Hope & Sons of Canada, Ltd., Peterboro.

FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

FOUNTAINS, DRINKING
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

FRICTION LEATHERS
Graton & Knight Mfg. Co., Montreal.

FRICTION SURFACE BELTING
Can. Consolidated Rubber Co., Ltd., Montreal

FUEL OIL SYSTEMS
Bowser & Co., S. F., Inc., Fort Wayne, Ind.
Gilbert & Barker Mfg. Co., Springfield, Mass.

FURNACES, ANNEALING, CASE HARDENING AND TEMPERING
Bellevue Furnace Co., Detroit, Mich.
Chicago Flexible Shaft Co., Chicago, Ill.
Gilbert & Barker Mfg. Co., Springfield, Mass.
Mechanical Engineering Co., Three Rivers, Que.
Standard Fuel Engr. Co., Detroit, Mich.
Williams & Wilson, Limited, Montreal, Que

FURNACES, BLAST
Belleview Industrial Furnace Co., Detroit.
Toronto Iron Works Ltd., Toronto.

FURNACES, FORGING
Gilbert & Barker Mfg. Co., Springfield, Mass.
Standard Fuel Engineering Co., Detroit, Mich.

FURNACES, HIGH SPEED STEEL, SHELL
Standard Fuel Engineering Co., Detroit, Mich.

FURNACES, LEAD AND SALT
Standard Fuel Engineering Co., Detroit, Mich.

FURNACES, RIVETING
Standard Fuel Engineering Co., Detroit, Mich.

FUSE BOXES, STEEL
Dom. Forge & Stamping Co., Walkerville, Ont.

GAUGES, MANUFACTURERS, LIMIT, THREAD
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

GALVANIZING PLANT
Manitoba Bridge & Iron Wks., Ltd., Wpg., Can

GANG PLANER TOOLS
Armstrong Bros. Tool Co., Chicago.

GASKETS, LEATHER, ETC.
Graton & Knight Mfg. Co., Montreal.

GASOLINE METERS
Bowser & Co., S. F., Inc., Fort Wayne, Ind.

GASOLINE TANKS
Bowser & Co., S. F., Inc., Fort Wayne, Ind.

GASOLINE PUMPS, SELF-MEASURING
Bowser & Co., S. F., Inc., Fort Wayne, Ind

GAUGES
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.

GAUGES, CALIPERS
Williams & Co., J. H., Brooklyn, N.Y.

GAUGES, MERCURY COLUMN, DRAFT
Taylor Instrument Co., Rochester, N.Y.

GAUGES, FUSE HOLE
Windsor Mach. & Tool Co., Windsor, Ont.

GAUGES, HYDRAULIC
Taylor Instrument Co., Rochester, N.Y.

GAUGES, STANDARD
Brown Engineering Corp., Toronto, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Machine Co., New Bedford.
Normac Machine Co., St. Catharines, Ont.
Peck, Stow & Wilcox Co., Southington, Conn.
Pratt & Whitney Co., Hartford, Conn.
Swedish Gage Co., Inc., Montreal.
Swedish Gage Co., New York, N.Y.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.
Toronto Tool Works, Toronto, Ont.
United Brass & Lead, Ltd., Toronto.
Wells Brothers Co. of Canada, Galt, Ont.
Worth Engineering Co., Toronto, Ont.

GAUGES, VACUUM AND PRESSURE
Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Rochester, N.Y.

GAGES, SNAP, THREAD AND CYLINDRICAL
Swedish Gage Co., New York, N.Y.

GEAR BLANKS
Can. Steel Foundries, Ltd., Montreal, Que.
Dom. Foundries & Steel, Ltd., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

GEAR BLANKS, CAST
Katie Foundry, Galt, Ont.

GEAR-CUTTING MACHINERY
Bilton Mach. Tool Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto, Ont.
D. E. Whiton Machine Co., New London, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

GEAR-TESTING MACHINE
Gisholt Machine Co., Madison, Wis.

GEAR-TURNING MACHINES, BEVEL
Bridgeford Mach. Tool Works, Rochester, N.Y

GEAR BOXES, REDUCTION
Coventry Chain Co., Coventry, Eng.

GEARS, CUT, MORTISE, ANGLE, WORM
Baxter & Co., Ltd., J. R., Montreal, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
Dom. Foundries & Steel, Ltd., Hamilton, Ont.
Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Victoria Foundry Co., Ottawa.
Hull Iron & Steel Foundries, Ltd., Hull, Que.
Illinois Tool Works, Chicago, Ill.
Jones & Glassco, Montreal.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Wilson & Co., J. C., Belleville, Ont.

GEARS, RAWHIDE
Gardner, Robt., & Son, Montreal
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal.
Philadelphia Gear Works, Philadelphia, Pa.
A. R. Williams Machy. Co., Toronto.

GENERATORS, ELECTRIC
Canadian Fairbanks-Morse Co., Montreal.
Lancashire Dynamo & Motor Co., Toronto.
MacGovern & Co., Montreal, Que.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que

GENERATORS, MOTOR
MacGovern & Co., Montreal, Que.

GERMAN SILVER
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

GLUE HEATERS
Oliver Machinery Co., Grand Rapids, Mich.

GLASSES, SAFETY
Strong, Kennard & Nutt Co., Cleveland, Ohio
Willson & Co., Inc., T. A., Reading, Pa

GOVERNOR, WATER WHEEL
Wilson & Co., J. C., Belleville, Ont.

GRAPHITE
Aikenhead Hardware, Ltd., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.

GOGGLES
Consolidated Optical Co., Toronto, Ont.
Standard Optical Co., Geneva, N.Y.
Strong, Kenard & Nutt Co., Cleveland, Ohio
Willson & Co., Inc., T. A. Reading, Pa.
Welding & Supplies Co., Montreal, Que.

GRAVITY CARRIERS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

GREASE CUPS, PRESSED STEEL, BRASS
Can. Winkley Co., Ltd., Windsor, Ont.

GREASES (SEE LUBRICANTS)

GRINDERS, AUTOMATIC KNIFE
W. H. Banfield & Son, Toronto.
Canada Machinery Corp., Galt, Ont.
Foss Mchy. & Supply Co., The Geo. F., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.

GRINDERS, CENTRE COLUMN, PEDESTAL AND BENCH
Wisconsin Electric Co., Inc., Racine, Wis.
Blake & Johnson Co., Waterbury, Conn.
Can. Machinery Corp., Galt, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & Supply Co., The Geo. F., Montreal
Garlock-Walker Machinery Co., Toronto, Ont.
Katie Foundry, Galt, Ont.
Modern Tool Co., Erie., Pa.
Morse Twist Drill & Machine Co., New Bedford.
Niles-Bement-Pond Co., New York, N.Y.
New Britain Machine Co., New Britain, Conn.
Perfect Machine Co., Galt, Ont.
United States Electrical Tool Co., Cincinnati, O.
Williams & Wilson, Limited, Montreal, Que.

GRINDERS, CUTTER
Brown & Sharpe Mfg. Co. Providence, R.I.
Cincinnati Milling Mach. Co., Cincinnati, Ohio.
The Geo. F. Foss Mchy. & Supply Co., Montreal
Garvin Machine Co., New York.
Greenfield Machine Co., Greenfield, Mass.
Grand Rapids Grinding Mach. Co., Grand Rapids, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
LeBlond Mach. Tool Co., R. K., Cincinnati, O
Norton Grinding Co., Worcester, Mass.
Perfect Machine Co., Galt, Ont.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

GRINDERS, DIE AND CHASER
Landis Machine Co., Waynesboro, Pa
Modern Tool Co., Erie, Pa.
National-Acme Co., Cleveland, Ohio.

GRINDERS, DISK
Armstrong Bros. Tool Co., Chicago, Ill.
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.
Heald Machine Co., Worcester, Mass.

GRINDERS, DRILL
Aikenhead Hardware Co., Toronto, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garvin Machine Co., New York.
Grand Rapids Grinding Mach. Co., Grand Rapids, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
United States Electrical Tool Co., Cincinati, O.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

GRINDERS, CYLINDER, INTERNAL
Brown & Sharpe Mfg. Co., Providence, R.I.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Greenfield Machine Co., Greenfield, Mass.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Norton Grinding Co., Worcester, Mass
Perfect Machine Co., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que

GRINDERS, PORTABLE, ELECTRIC, HAND, TOOL POST, FLOOR AND BENCH
Baird Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Cincinnati Electrical Tool Co., Cincinnati, Ohio
Ford-Smith Mach. Co., Hamilton Ont.
Wisconsin Electric Co., Inc., Racine, Wis.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Grant Mfg. & Machine Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Independent Pneumatic Tool Co., Chicago, Ill.
United States Electrical Tool Co., Cincinati, O
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que
Wilkinson & Kompass, Hamilton, Ont.

GRINDERS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill

GRINDERS, ROTARY SURFACE
Bristol Machine Tool Co., Bristol, Conn.

GRINDERS, TOOL AND HOLDER
Armstrong Bros. Tool Co., Chicago.
W. F. & John Barnes Co., Rockford, Ill.
Blake & Johnson Co., Waterbury, Conn.
Blount, J. G., & Co., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Ford-Smith Machine Co., Hamilton, Ont.
Grand Rapids Grinding Mach. Co., Grand Rapids, Mich.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
National-Acme Co., Cleveland, Ohio.
Tabor Mfg. Co., Philadelphia, Pa.
Wells Bros. of Can., Galt, Ont.
Wing & Son, J. E., Hamilton, Ont.

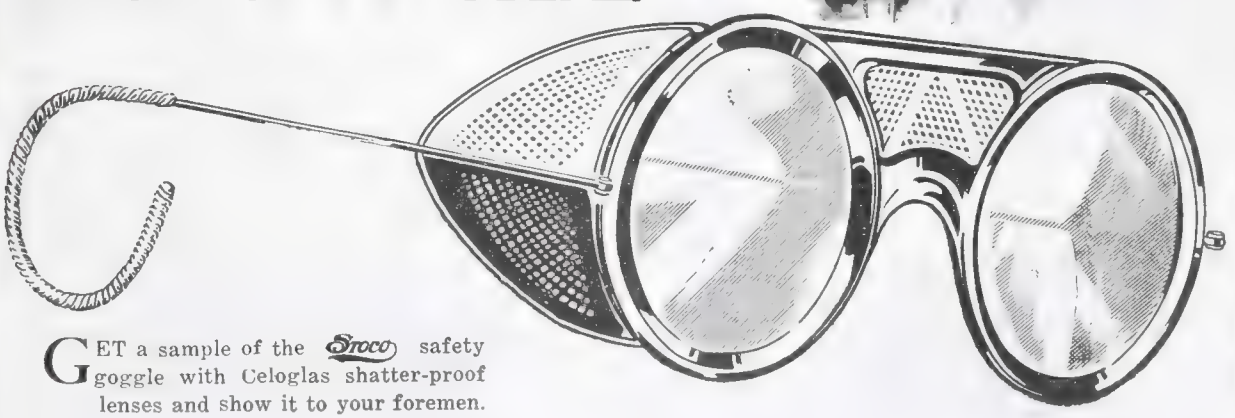
GRINDERS, UNIVERSAL, PLAIN
Grand Rapids Grinding Mach. Co., Grand Rapids, Mich.
Modern Tool Co., Erie, Pa.
Norton Grinding Co., Worcester, Mass.
Williams & Wilson, Limited, Montreal, Que

GRINDERS, VERTICAL SURFACE
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Heald Machine Co., Worcester, Mass.
Pratt & Whitney Co., Dundas, Ont.
Reed-Prentice Co., Worcester, Mass.
Wing & Son, J. E., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis
Norton Grinding Co., Worcester, Mass.
Williams & Wilson, Limited, Montreal, Que.

GRINDING AND POLISHING MACHINES, PORTABLE, PNEUMATIC AND SPRING FRAME
Can. Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner, Robt., & Son, Montreal.
Garvin Machine Co., New York.
Garlock-Walker Machinery Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Hall & Sons, John H., Brantford.
LeBlond Mach. Tool Co., R. K., Cincinnati.
Niles-Bement-Pond Co., New York N.Y
Norton Grinding Co., Worcester, Mass.

These Stoco CELOGLAS SHATTER-PROOF LENS SAFETY GOGGLES will make my men EYE SAFE





GET a sample of the Stoco safety goggle with Celoglas shatter-proof lenses and show it to your foremen. Have them give it a trial under actual working conditions, and it won't take them long to decide that it's the kind of eye protection their men need.

The Stoco safety goggle frame is the strongest ever designed for eye protection purposes. In spite of its sturdy construction it is light in weight and mighty comfortable in use.

Stoco safety goggles are supplied with either easy cable earbows or elastic headbands, and also with regular heavyweight glass lenses or Celoglas shatter-proof lenses. Celoglas lenses have a thin piece of celluloid between two glass lenses. Even though the glass may fracture from a hard blow, the lens will not leave the frame nor will particles of glass fly into the eyes of the wearer.

The price of Stoco safety goggles with Celoglas lenses is $115.00 per hundred pairs; with regular glass lenses, $90.00. Sample free on request to Safety Engineers or Superintendents.

STANDARD OPTICAL CO.
GENEVA, N.Y.

Wisconsin Electric Co., Racine, Wis.
Williams & Wilson, Limited, Montreal, Que.

GRINDING MACHINES, CAR WHEEL, CUTTER, CYLINDRICAL, CRANKSHAFT
Norton Grinding Co., Worcester, Mass.

GRINDING WHEELS
Aikenhead Hardware Co., Toronto, Ont.
Baxter Co., Ltd., J. R., Montreal, Que.
Brantford Emery Wheel Co., Brantford, Canada.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Mahcine Co., Hamilton, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal
Norton Co., Worcester, Mass.

GRIT, ANGULAR
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

GUARDS, WINDOW AND MACHINE
Canada Machinery Corp., Galt, Ont.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ontario.
New Britain Mach. Co., New Britain, Conn.
Page Steel & Wire Co., Adrian, Mich.

GUN AND AMMUNITION SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

GUN TAPS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

HANDLES, BALANCE, CRANK AND MACHINE
Williams & Co., J. H., Brooklyn, N.Y.

HACK SAW BLADES
Aikenhead Hardware Co., Toronto, Ont.
Baxter & Co., Ltd., J. R., Montreal, Que.
Boker & Co., Inc., H., Montreal, Que.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Ford-Smith Machine Co., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Fry's (London), Ltd., London, England.
Racine Tool & Machine Co., Racine, Wis.
Plewes, Ltd., Winnipeg, Man.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
L. S. Starrett Co., Athol, Mass.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Victor Saw Works, Ltd., Hamilton, Canada.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Limited, Montreal, Que.

HACK SAW FRAMES
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York City.
Victor Saw Works, Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Limited, Montreal, Que.

HACK SAWS, POWER
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Works, Buffalo, N.Y.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
McKenzie Machy. Co., D., Guelph, Ont.
Peerless Machine Co., Racine, Wis.
Perfect Machine Co., Galt, Ont.
Racine Tool & Mach. Co., Racine, Wis.
L. S. Starrett Co., Athol, Mass.
Victor Saw Works, Hamilton, Ont.
Williams Machy. Co., A. R., Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.
Williams & Wilson, Limited, Montreal, Que.

HAMMERS, AIR
Erie Foundry Co., Erie, Pa.

HAMMERS (DROP), MOTOR AND BELT DRIVEN
Beaudry & Co., Boston, Mass.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canadian Billings & Spencer Ltd., Welland.
Canada Machinery Corp., Galt, Ont.
High Speed Hammer Co., Rochester, N.Y.
A. B. Jardine & Co., Hespeler, Ont.
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Canada Machinery Corp., Galt, Ont.
West Tire Setter Co., Rochester, N.Y.
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Matthews, Jas. H. & Co., Pittsburgh, Pa.

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Erie Foundry Co., Erie, Pa.
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Beaudry & Company, Inc., Boston, Mass.

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Oliver Machinery Co., Grand Rapids Mich

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Algoma Steel Corp., Sault Ste. Marie, Ont.
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Jones & Glassco, Montreal.
Standard Pressed Steel Co., Philadelphia, Pa.
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Can. Blower & Forge Co., Kitchener, Ont.
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Illinois Tool Works, Chicago, Ill.
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Can. Matthews Gravity Carrier Co., Toronto, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
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Northern Crane Works, Walkerville, Ont.
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HOLDERS, ELECTRIC
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Taylor Instrument Co., Rochester, N.Y.

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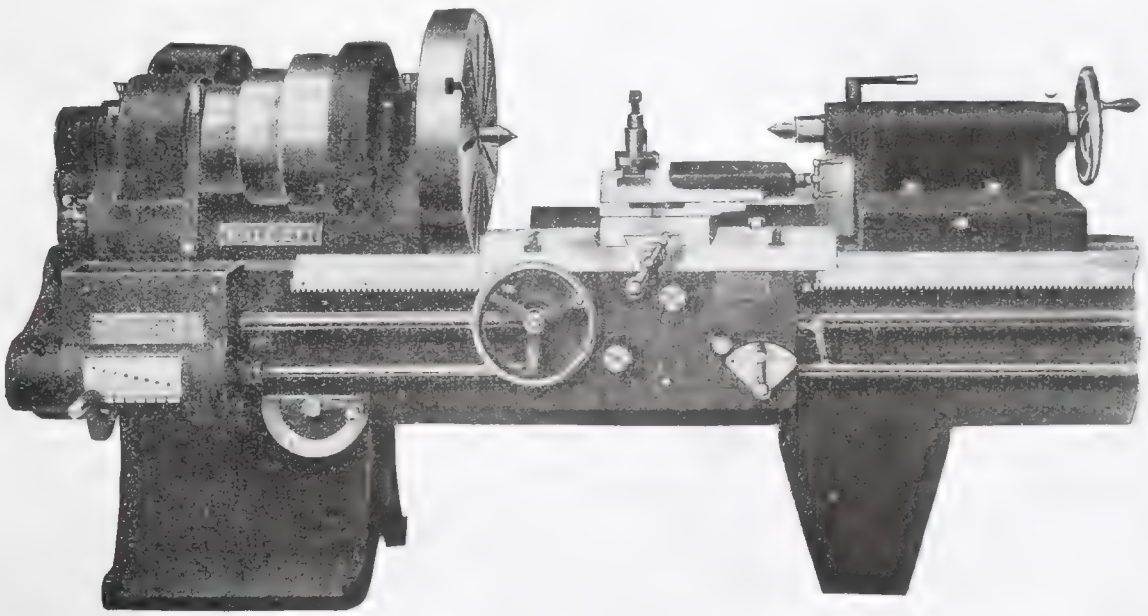
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Fox Machine Co., Jackson, Mich.
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Hendey Mach. Co., Torrington, Conn.
Hinckley Machine Works, Hinckley, Wis.
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Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss, The Geo. F., Mchy. & Supply Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
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Gooley & Edlund, Inc., Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio.
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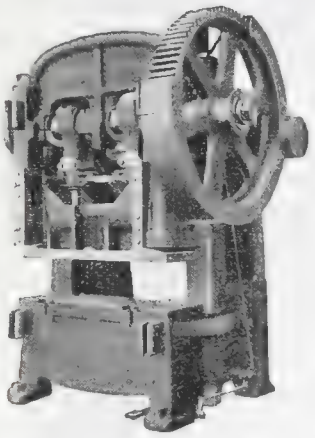


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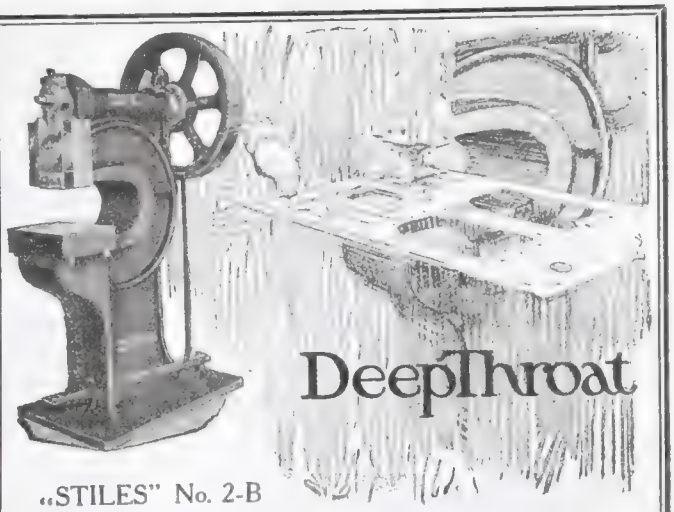


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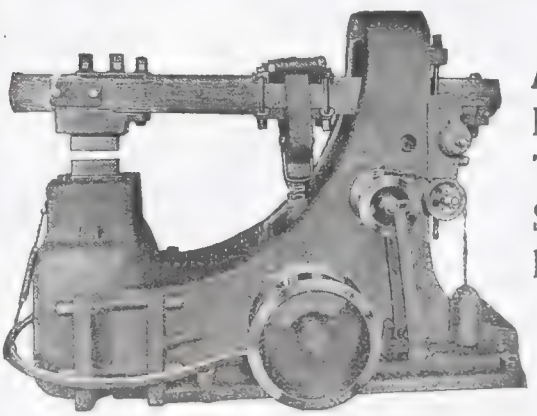
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Williams & Wilson, Limited, Montreal, Que.

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Fry's (London), Ltd., London, England.
M. L. Oberdorfer Brass Co., Syracuse, N.Y.
Trahern Pump Co., Rockford, Ill.

PUMPS, MOTOR AND BELT DRIVEN
Darling Bros., Ltd., Montreal, Quebec.
MacGovern & Co., Montreal, Que.
M. L. Oberdorfer Brass Co., Syracuse, N.Y.

PUMPS, STEAM AND CENTRIFUGAL
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

PUMPS, SUD
Fry's (London), Ltd., London, England.

PUMP LEATHERS
Graton & Knight Mfg. Co., Worcester, Mass.

PUNCHES AND DIES
W. H. Banfield & Sons, Toronto.
E. W. Bliss Co. Brooklyn, N.Y.
Boker & Co., Inc., H., Montreal, Que.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Blower & Forge Co., Kitchener, Ont.
Ferracute Mach. Co., Bridgeton, N.J.
Can Fairbanks-Morse Co., Montreal.
Gardner, Robt. & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Mulliner-Enlund Tool Co., Syracuse, N.Y.
Marten Machine Co., Hamilton, Ont.
Peck, Stow & Wilcox Co., Southington, Conn.
Pratt & Whitney Co., Dundas, Ont.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson, Limited, Montreal, Que.

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Peck, Stow & Wilcox Co., Southington, Conn.

PUNCHES, POWER
John Bertram & Sons Co., Dundas, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Ferracute Mach. Co., Bridgeton, N.J.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Limited, Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Stoll Co., D. H., Buffalo, N.Y.
Wickes & Co., Saginaw, Mich
Williams & Wilson, Limited, Montreal, Que.

PUNCHES, CHROME, VANADIUM SHELL
Hammond Steel Co., Inc., Syracuse, N.Y.

PUNCHING MACHINES, HORIZONTAL
Bertrams, Ltd., Edinburgh, Scotland.
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Wickes & Co., Saginaw, Mich.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal, Que.

PYROMETERS
Bristol Co., Waterbury, Conn., U.S.A.
Shore Instrument & Mfg. Co., New York City
Taylor Instrument Co., Rochester, N.Y.
Thwing Instrument Co., Philadelphia, Pa

QUARTERING MACHINES
Bertram & Sons Co., John, Dundas, Ont.
Niles-Bement-Pond Co., New York.

RAILING, IRON AND BRASS
United Brass & Lead, Ltd., Toronto, Ont.

RAIL BENDERS
Algoma Steel Corp., Sault Ste. Marie, Ont.
Niles-Bement-Pond Co., New York.

RADIAL DRILLING MACHINE, WALL
Lynd-Farquhar Co., Boston.
Wickes & Co., Saginaw, Mich.

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Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal, Que.

RAIL OVERHEAD
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

RAILWAY EQUIPMENT
Manitoba Bridge & Iron Wks., Ltd., Wpg., Can

RATCHETS
Keystone Mfg. Co., Buffalo, N.Y.

RAW HIDE PINIONS (SEE GEARS)

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Cleveland Twist Drill Co., Cleveland.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
The McCrosky Reamer Co., Meadville, Pa.
The Kelly Reamer Co., Cleveland, O.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.
Wells Bros. of Can., Galt, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

REAMERS, PIPE, CYLINDER AND LOCOMOTIVE
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Kelly Reamer Co., Cleveland, O.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

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Baxter & Co., Ltd., J. R., Montreal, Que.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
The McCrosky Reamer Co., Meadville, Pa.
Cleveland Twist Drill Co., Cleveland.
Gisholt Machine Co., Madison, Wis.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

REAMERS, STEEL TAPER AND SELF-FEEDING
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Illinois Tool Works, Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

REAMERS, BOILER
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

REAMERS, CHUCKING
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

REAMERS, HAND
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

REAMERS, EXPANDING
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

REAMERS, PIN
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

REAMER FLUTING MACHINES
Garvin Machine Co., New York.

REAMERS, TAPER, BRIDGE
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

REAMERS, PIPE, SHELL
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

REAMING MACHINES, PNEUMATIC
Cleveland Pneumatic Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.

RECORDING INSTRUMENTS
Bristol Co., Waterbury, Conn.
Gisholt Machine Co., Madison, Wis.
Taylor Instrument Co., Rochester, N.Y.

REELS, WIRE AND TEXTILE MFG.
American Pulley Co., Philadelphia, Pa.

REGULATORS, AUTOMATIC
Electric Steels & Metals, Ltd., Welland, Ont.

REGULATORS, PRESSURE TEMPERATURE
Can. Fairbanks-Morse Co., Montreal.
Taylor Instrument Co., Rochester, N.Y.

RESPIRATORS
Strong, Kennard & Nutt Co., Cleveland, Ohio.

RIVETS, TUBULAR, BIFURCATED
Parmenter & Bulloch Co., Gananoque.
Rice Lewis & Son, Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

RIVETS, IRON, COPPER AND BRASS
Aikenhead Hardware Co., Toronto, Ont.
Manitoba Bridge & Iron Wks., Ltd., Wpg., Can.
Parmenter & Bulloch Co., Gananoque.
Rice, Lewis & Son, Toronto, Ont.
Steel Co. of Canada Ltd., Hamilton, Ont.

RIVETERS, PNEUMATIC, HYDRAULIC, HAMMER, COMPRESSION
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Montreal
Cleveland Pneumatic Tool Co. of Canada, Toronto
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
Niles-Bement-Pond Co., New York.

RIVETING MACHINES, ELASTIC ROTARY BLOW
Grant Mfg. & Machine Co., Bridgeport, Conn.
High-Speed Hammer Co., Rochester, N.Y.
Williams & Wilson, Limited, Montreal, Que.
F. B. Shuster Co., New Haven, Conn.

ROAD BUILDING EQUIPMENT
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Manitoba Bridge & Iron Wks., Ltd., Wpg., Can

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General Steel Co., Milwaukee.
Page Steel & Wire Co., Adrian, Mich.

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Can. Link-Belt Co., Toronto, Ont.
Jones & Glasco, Montreal.

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John Bertram & Sons Co., Dundas.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson, Limited, Montreal, Que.

ROTARY SHEARS
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Electric Steels & Metals, Ltd., Welland, Ont.

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Can. Link-Belt Co., Toronto.

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Bertrams, Ltd., Edinburgh, Scotland.

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Brown & Sharpe Mfg. Co., Providence.
James Chesterman & Co., Ltd., Sheffield, Eng.
Rice Lewis & Son, Toronto, Ont.
L. S. Starrett Co., Athol, Mass.

RULES, STEEL, STRAIGHT AND FOLDING
Lufkin Rule Co. of Can., Windsor, Ont.

RULES, BOXWOOD, FOLDING
Lufkin Rule Co. of Can., Windsor, Ont.

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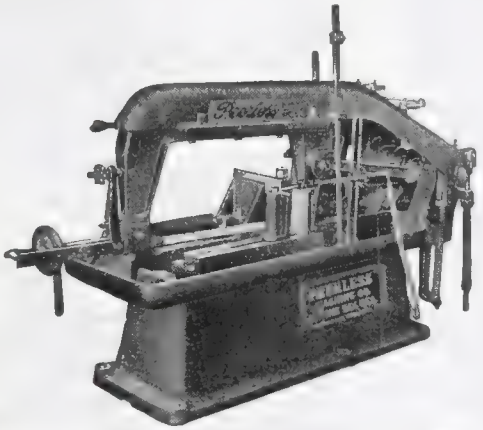
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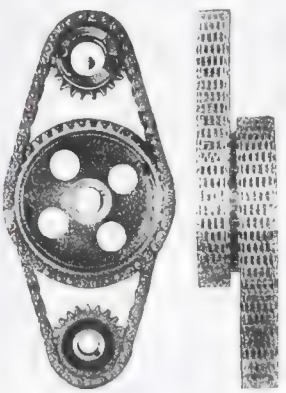
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Knight Metal Products, Ltd., Toronto, Ont.
United Brass & Lead, Ltd., Toronto.
Wentworth Mfg. Co., Hamilton, Ont.

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Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
H. C. Dodge, Inc., Boston, Mass.
Foster Machine Co., Elkhart, Ind.
Garlock Walker Machy. Co., Ltd., Toronto, Ont.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
A. B. Jardine & Co., Hespeler.
National Acme Co., Cleveland, Ohio.
New Britain Machine Co., New Britain, Conn
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto.
Wood Turret Mach. Co., Brazil, Ind., U.S.A
Williams & Wilson, Ltd., Montreal, Que

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Morse Twist Drill & Mch. Co., New Bedford, Mass
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Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont
Wells Bros. Co. of Canada, Galt, Ont.
Wilkinson & Kompass, Hamilton, Ont.

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National Acme Co., Cleveland, Ohio.
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Williams & Wilson, Limited, Montreal, Que.

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Allen Mfg. Co., Hartford, Conn.
Bristol Co., Waterbury, Conn., U.S.A.
Wilkinson & Kompass, Hamilton, Ont

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Jacobs Mfg. Co., Hartford, Conn.

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Garlock-Walker Machinery Co., Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Hamilton Mach. Tool Co., Hamilton, Ohio.
Rhodes Mfg. Co., Hartford, Conn.
Steptoe Co., John, Cincinnati, Ohio.
Williams & Wilson, Limited, Montreal, Que.

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Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Jones & Glassco, Montreal.
Niles-Bement-Pond Co., New York.
Can. Drawn Steel Co., Hamilton, Ont.
Pratt & Whitney Co., Dundas, Ont.
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A. R. Williams Machy. Co., Toronto.
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Wilson & Co., J. C., Belleville, Ont.
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Niles-Bement-Pond Co., New York
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Brown, Boggs Co., Ltd., Hamilton, Canada
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Ferracute Machine Co., Bridgeton, N.J.
Garlock-Walker Machinery Co., Toronto, Ont.
Wickes & Co., Saginaw, Mich.
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National Machy Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York
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Toledo Machine & Tool Co., Toledo.
Williams & Wilson, Limited, Montreal, Que.

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SHEARS, PNEUMATIC
Toledo Machine & Tool Co., Toledo, Ohio.

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SHEARS, PLATE CUTTING, SLITTING
The Quickwork Co., St. Mary's, Ohio.

SHEARS, SPLITTING
Peck, Stow & Wilcox Co., Southington, Conn.

SHEARS, IRREGULAR AND CIRCLE CUTTING
The Quickwork Co., St. Mary's, Ohio.

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Peck, Stow & Wilcox Co., Southington, Conn.

SHEARS, SERPENTINE
The Quickwork Co., St. Mary's, Ohio.

SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Canada
Stoll Co., D. H., Buffalo, N.Y.

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Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Peck, Stow & Wilcox, Southington, Conn.
Peck, Stow & Wilcox Co., Southington, Conn.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Limited, Montreal, Que.

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Norton, Ralph B., Agent, Montreal.

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Dominion Forge & Stpg. Co., Walkerville, Ont

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Sheldons, Ltd., Galt, Ont.

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High Speed Hammer Co., Rochester, N.Y.

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SHOP FURNITURE
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New Britain Mach. Co., New Britain, Conn.

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Can. B. K. Morton, Toronto, Montreal.
Williams & Co., J. H., Brooklyn, N.Y.

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Jones & Glassco, Montreal.

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Rice, Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilkinson & Kompass, Hamilton, Ont.

SLEDGES, CAST IRON
Katie Foundry, Galt, Ont.

SLINGS, CHAIN
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

SLOTTERS
Betts Machine Co., Rochester, N.Y.
Garvin Machine Co., New York.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York
Rhodes Mfg. Co., Hartford, Conn.

SMOKESTACKS
Canadian Welding Works, Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Quebec.
Marsh Engineering Works, Belleville, Ont

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Kearney & Trecker Co., Milwaukee, Wis.

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Brown & Sharpe Mfg. Co., Providence.
Cleveland Twist Drill Co., Cleveland.
Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass
Rice, Lewis & Son, Toronto, Ont.

SOCKET HEAD CAP SCREWS
Allen Mfg. Co., Hartford, Conn.

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Katie Foundry, Galt, Ont.

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Brown, Boggs & Co., Hamilton, Canada
Prest-O-Lite Co., Inc., Toronto, Ont.
Rice, Lewis & Son, Toronto, Ont.
United Brass & Lead Ltd., Toronto

SOLDER
Aikenhead Hardware Co., Toronto, Ont.
Rice, Lewis & Son, Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.
United Brass & Lead, Ltd., Toronto.

SPEED REDUCING GEARS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

SPIKES
Manitoba Bridge & Iron Wks., Ltd., Wpg., Can.

SPLICING CLAMPS
Peck, Stow & Wilcox Co., Southington, Conn.

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Barnes, Wallace Co., Bristol, Conn.
Can. Steel Foundries, Ltd., Montreal, Que.
Cleveland Wire Spring Co., Cleveland.
Dunbar Bros. Co., Bristol, Conn.
Garlock-Walker Machinery Co., Toronto, Ont.
Jas. Steele, Ltd., Guelph, Ont.

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Beaver Engineering Co., Montreal, Que.
Bertram, John, & Sons Co., Dundas.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Brown Engineering Corp., Toronto, Ont.
Ferracute Mach. Co., Bridgeton, N.J.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont
Garvin Machine Co., New York.
Gooley & Eglund, Inc., Courtland, N.Y.
John H. Hall & Sons, Brantford.
Hydraulic Machy. Co., Ltd., Montreal, Que.
A. B. Jardine & Co., Hespeler, Ont.
Katie Foundry Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Mulliner & Eglund Tool Co., Syracuse, N.Y
Marten Machine Co., Hamilton, Ont.
Reed-Prentice Co., Worcester, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Stoll Co., D. H., Buffalo, N.Y.
Victoria Foundry Co., Ottawa, Ont.
Welland Motor & Machine Co., Welland, Ont
Wilson & Co., J. C., Belleville, Ont.
William R. Perrin, Ltd., Toronto.
Windsor Mach. & Tool Co., Windsor, Ont.

SPRING COILING AND WINDING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.
Sleeper & Hartley, Inc., Worcester, Mass.

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Baird Machine Co., Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

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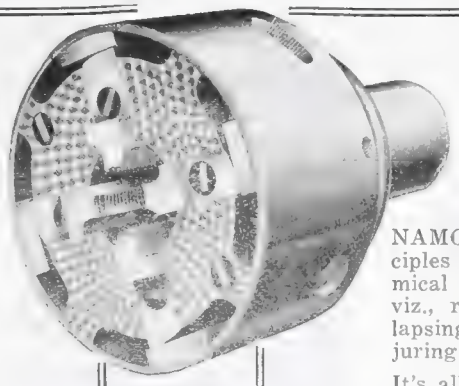
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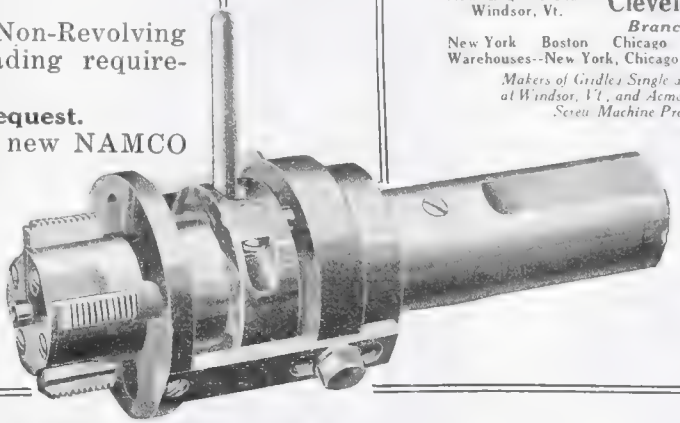
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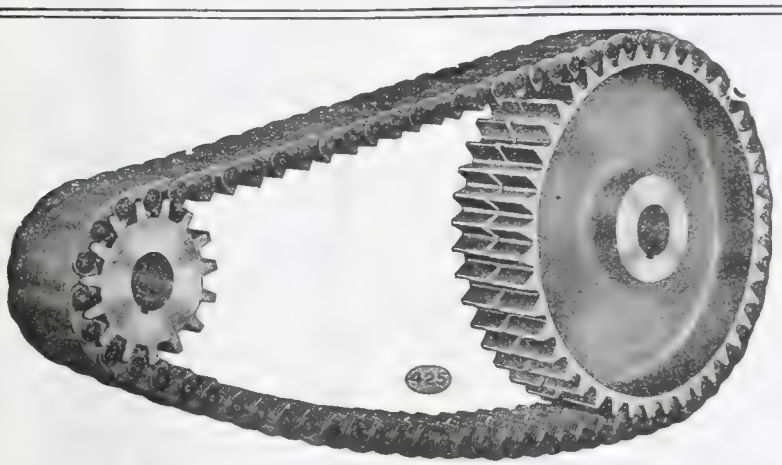
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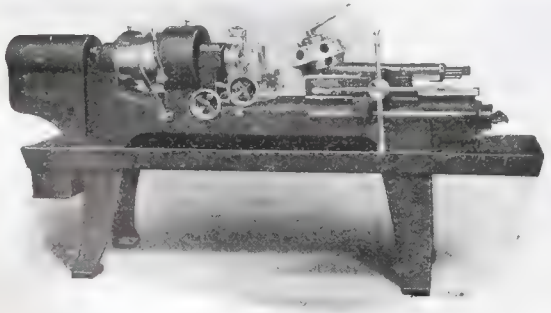
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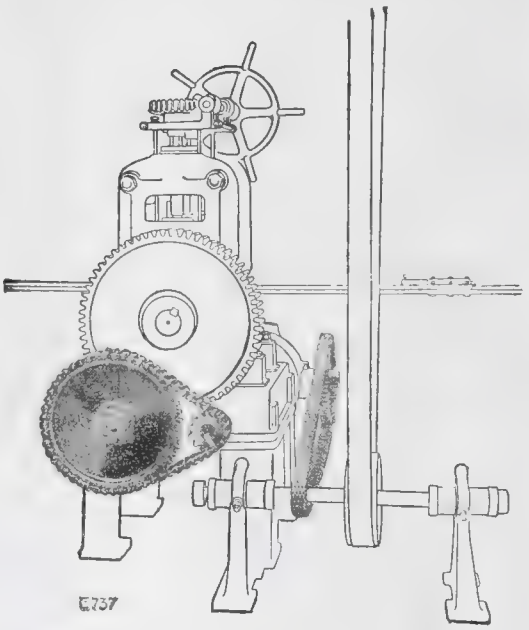
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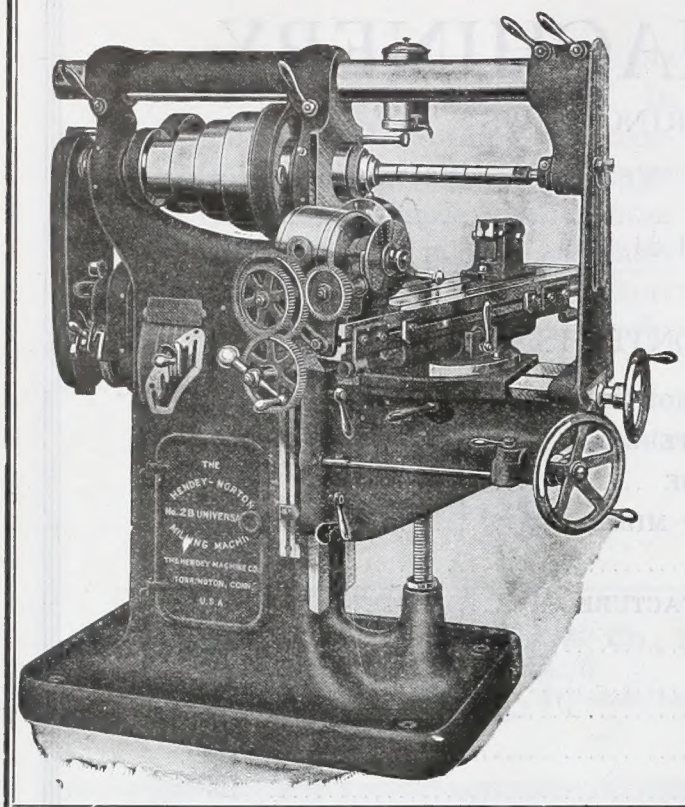
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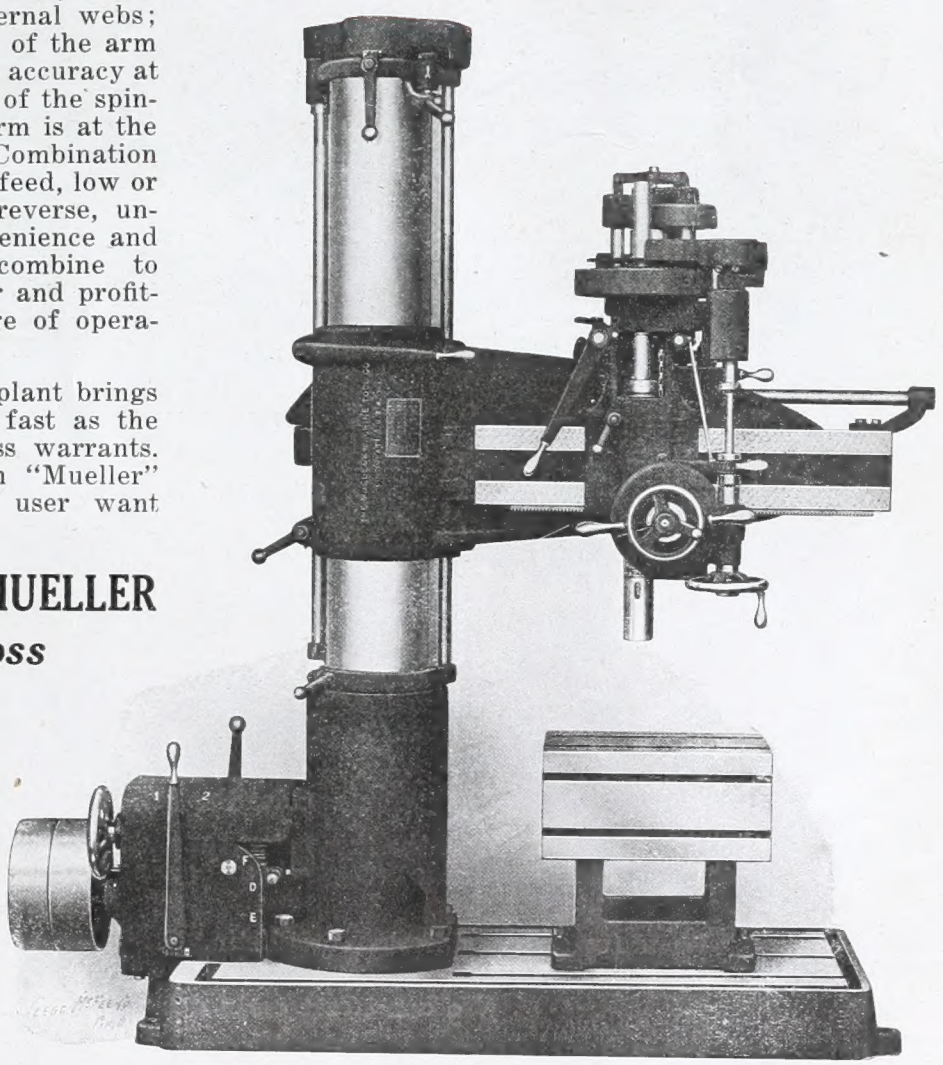
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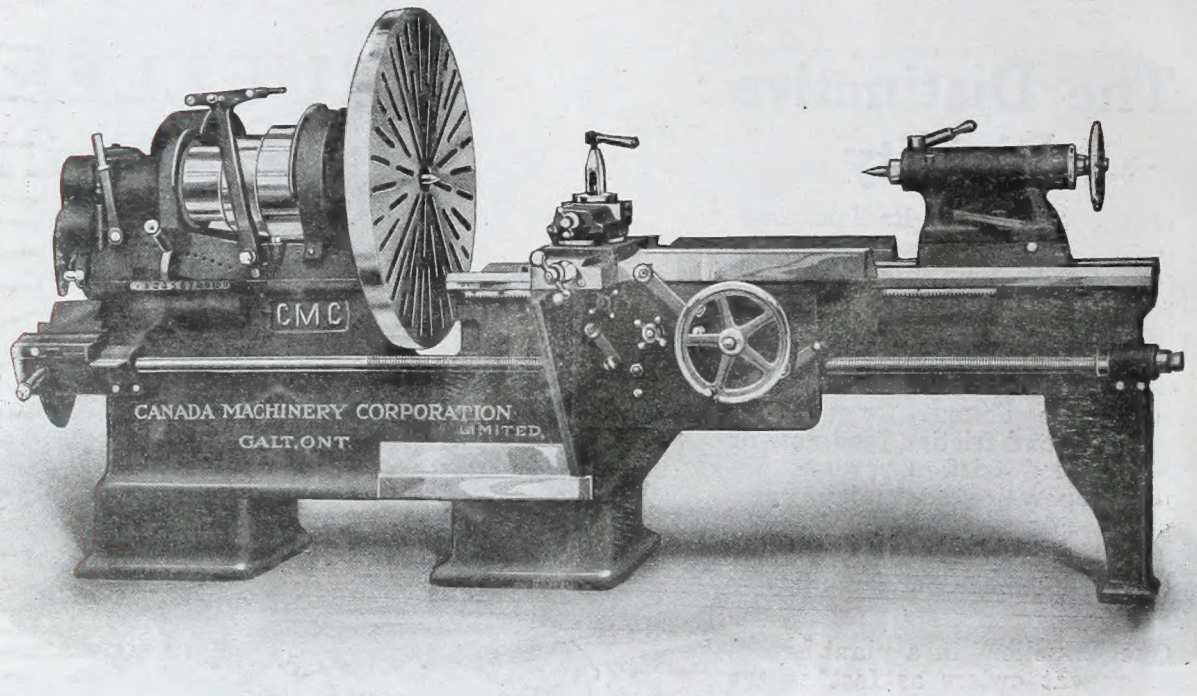
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